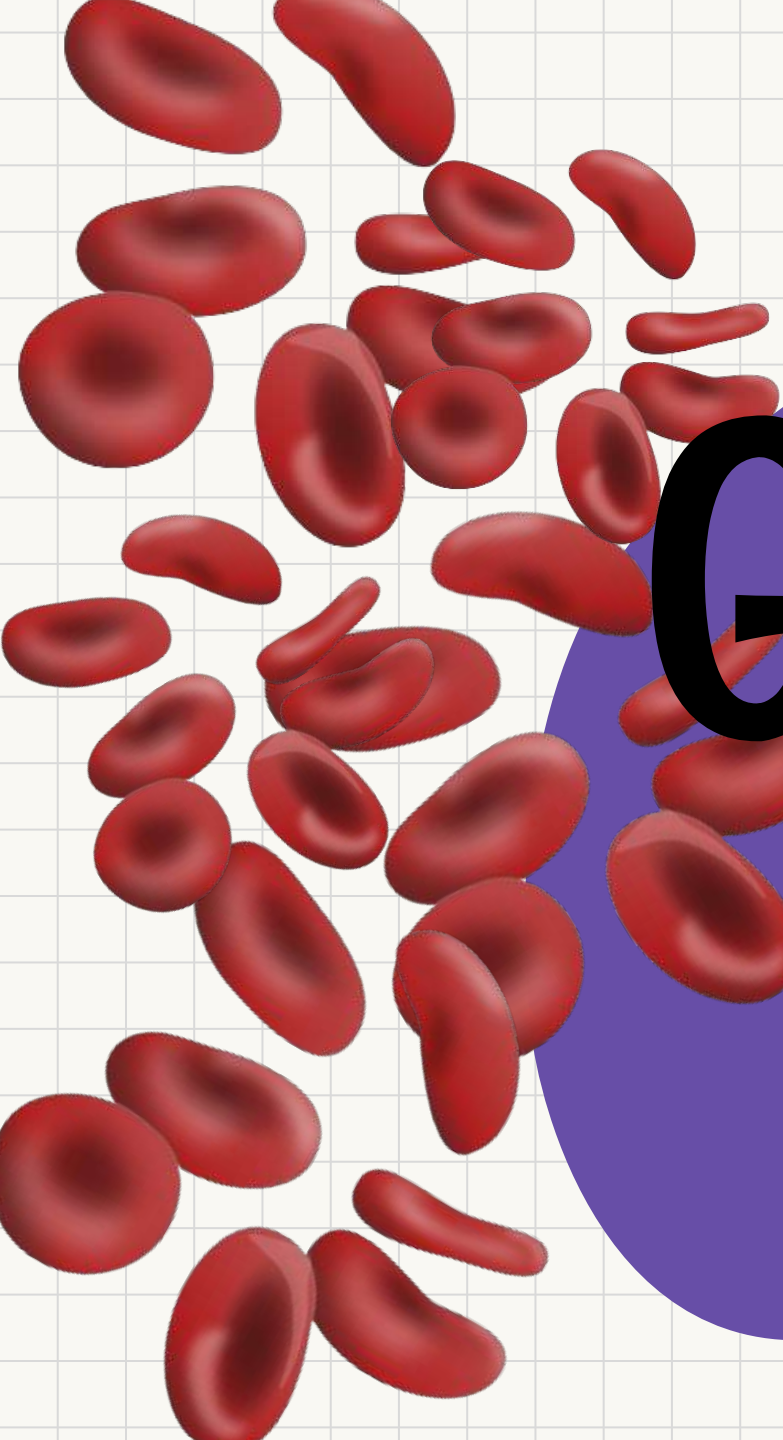
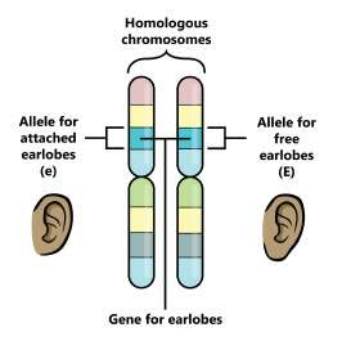
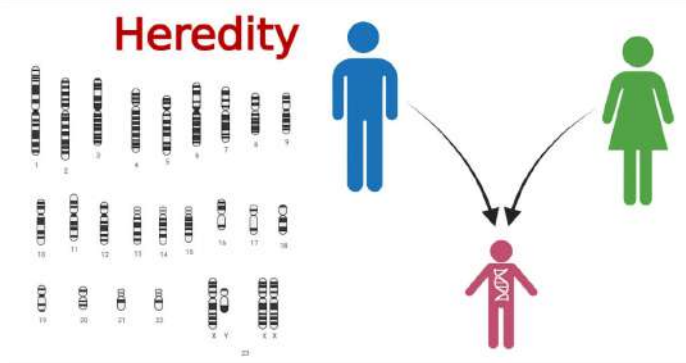


Genetics
Task Cards

front



Question 1



Genetics Vocabulary - Explanation

Explain the significance of the terms **Gene, Allele, Loci, Recessive, Dominant**, in the broader context of **heredity**.

flip

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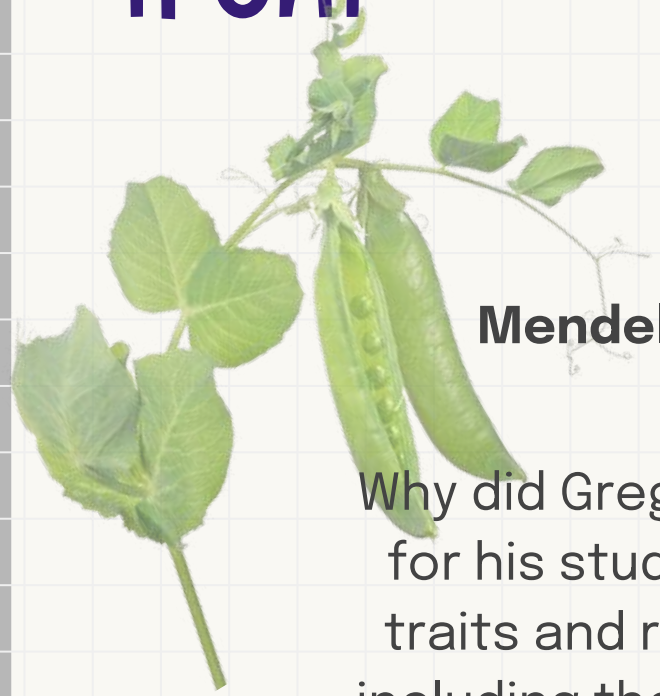

Question 2

Khan Academy

Mendel's Choice of Pea Plants - Understanding

Why did Gregor Mendel choose pea plants for his studies? Consider their different traits and reproductive characteristics, including the terms Genetic Disorders and Traits.

flip

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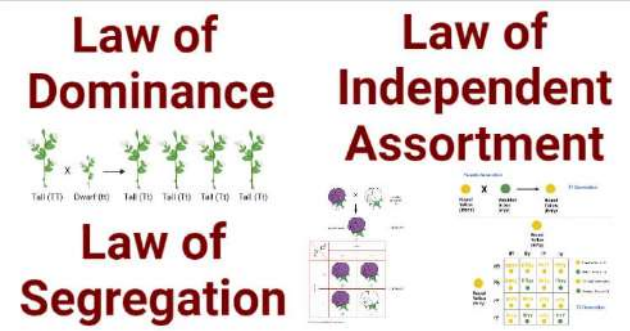
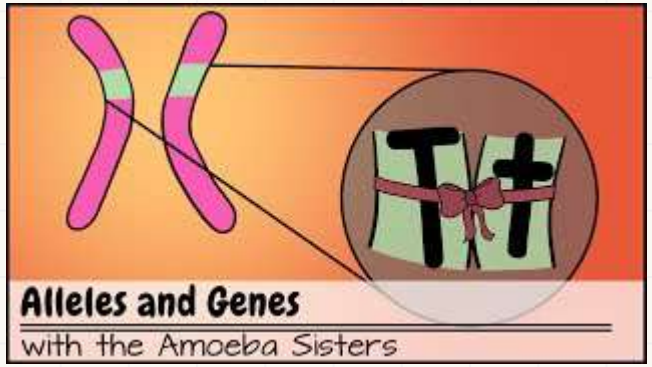


Question 3



Laws of Inheritance - Vocabulary Practice

Explain the concepts of the Law of Segregation and the Law of Independent Assortment in the broader context of heredity.

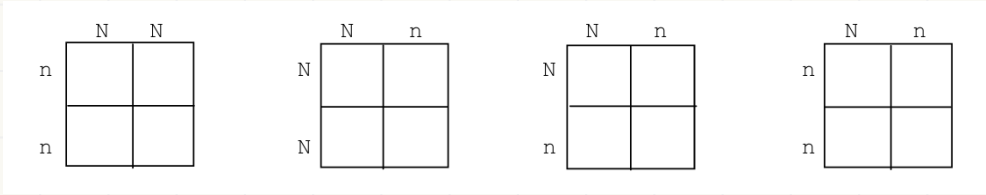
flip

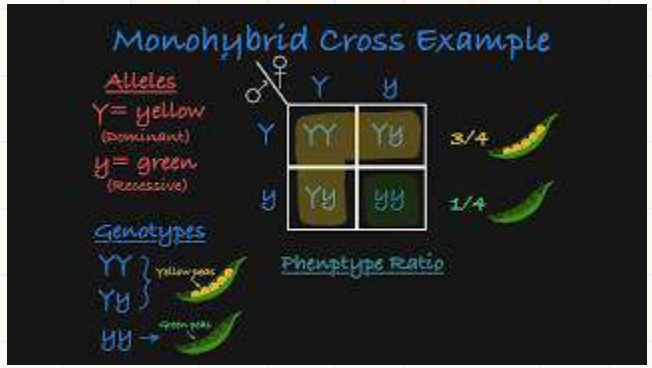
front

Question 4

Monohybrid Cross - Basic Problem Solving

Use a Punnett square to predict the outcomes of a Monohybrid Cross with homozygous dominant and homozygous recessive parents. Explain the importance of Genotype and Phenotype in hereditary outcomes.





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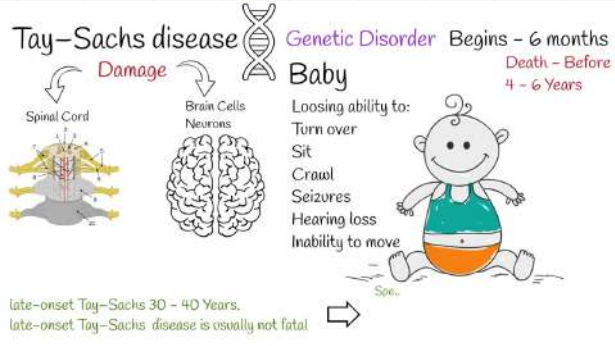


Question 5

Genetic Disorders - Vocabulary in Context

Discuss how terms like Incomplete Dominance, Codominance, and Recessive play a role in understanding Genetic Disorders within the broader context of heredity.

flip

front

Question 6

Test Cross - Application

Perform a Testcross to determine the Genotype of an organism with a Dominant Phenotype. Explain how this helps in understanding the hereditary traits.

1. In fruit flies, red eyes are dominant over brown eyes. You manage to capture a red-eyed fruit fly and desire to learn more about its genotype.

a. Give the **phenotypes** (physical eye color) of the flies involved in your test-cross:

_____ X _____

b. If the two flies have 400 offspring that all turn out to be red-eyed, what would be the **genotypes** of the flies used in your test-cross? (Use "R" and "r")

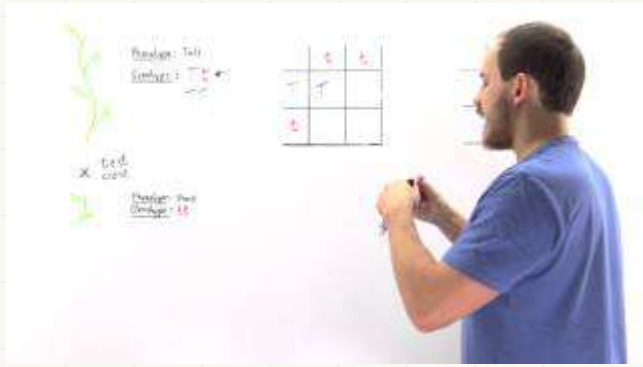
_____ X _____

Complete the cross on the right:

What percentage is heterozygous? = _____%

What percentage shows the dominant trait? =_____%

c. If you performed the same experiment but this time 200 of the 400 flies had brown eyes, what would be the genotype of the red-eyed fly? _____



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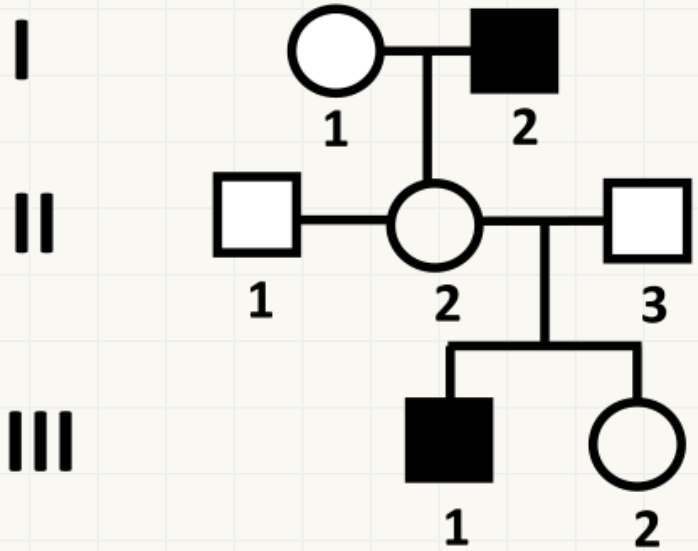
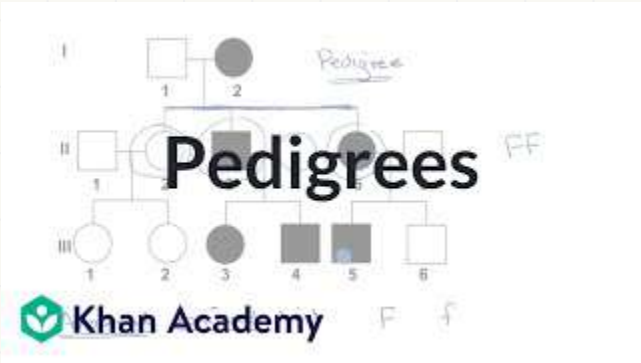
Question 7

Pedigree Analysis - Basic Interpretation

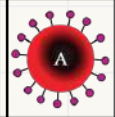
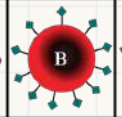
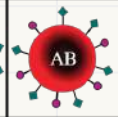
Analyze a simple Pedigree to understand patterns of inheritance and identify carriers. Explain how the information in pedigrees contributes to our understanding of heredity.





flip

front

	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in red blood cell	A antigen	B antigen	 A and B antigens	None

Question 8

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Non-Mendelian Inheritance - Vocabulary in Context

Discuss how terms like Incomplete Dominance, Codominance, and Polygenic Trait relate to and influence Non-Mendelian Inheritance within the broader context of heredity.

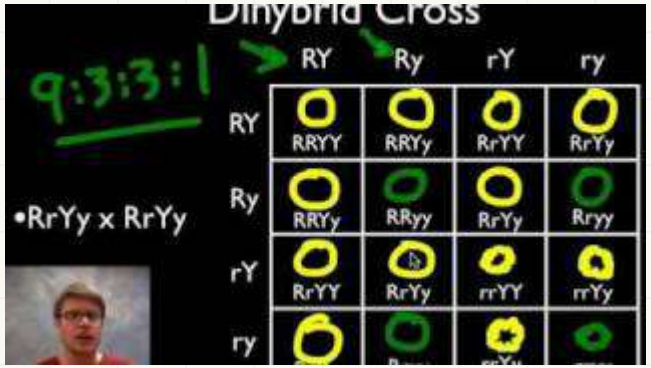
flip

front

Dihybrid Cross - Practice

Solve a basic Dihybrid Cross problem using Punnett squares and determine the possible outcomes. Explain how this relates to the broader concept of heredity, emphasizing terms like Dominant and Recessive.

Question 9



Gray is dominant with Black eyes being dominant

2. A male rabbit with the genotype GGbb is crossed with a female rabbit with the genotype ggBb the square is set up below. Fill it out and determine the phenotypes and proportions in the offspring.

	Gb	Gb	Gb	Gb
gB				
gB				
gb				
gb				

How many out of 16 have gray fur and black eyes? _____

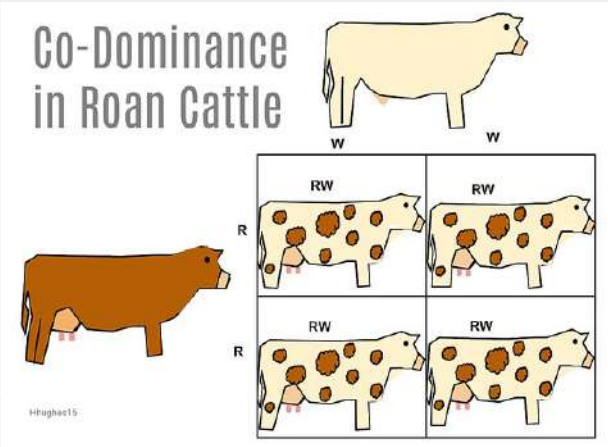
How many out of 16 have gray fur and red eyes? _____

How many out of 16 have white fur and black eyes? _____

How many out of 16 have white fur and red eyes_____

flip

front



Question 10

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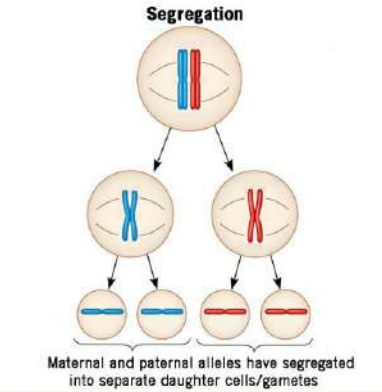
Genotype vs. Phenotype - Compare & Contrast

Differentiate between Genotype and Phenotype in the context of genetic traits.

flip

front

Question 11



Law of Segregation - Practical Example

Apply the Law of Segregation to predict the inheritance of a specific trait in a family. Explain how this example contributes to our understanding of heredity.

flip

front

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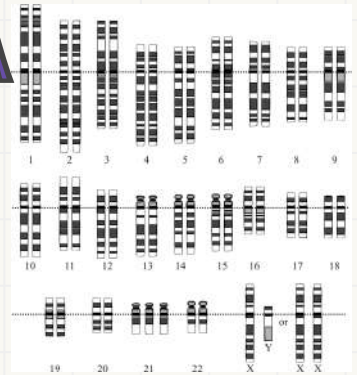
Question 12

Genetic Disorders - Identification

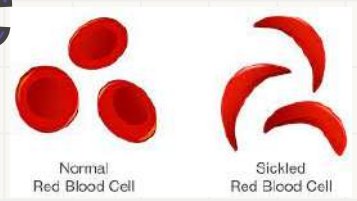
Identify Genetic Disorders based on given traits and explain the associated phenotypes. Discuss how these genetic disorders are indicative of hereditary factors.

A

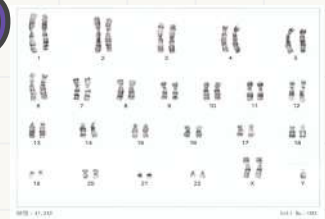


B

C



D



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Question 13

Parental Genotypes - Inference

Infer from Parental Genotypes based on possible genotypes in the offspring of a Genetic Cross. Explain how this inference contributes to our understanding of heredity, emphasizing terms like Phenotype and Dominant.

AaBB x aaBb

1. AABB
2. Aabb
3. aaBb
4. AAbb
5. AABb

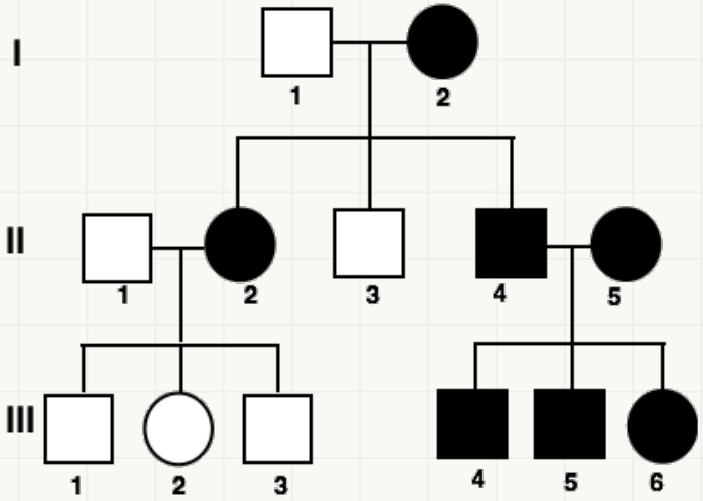
flip

front

Pedigree Analysis - Intermediate Interpretation

Interpret a Pedigree with slightly more complexity, focusing on understanding patterns of inheritance and the terms P Generation and X-linked Traits. Discuss the broader implications for understanding heredity.

Question 14



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flip

front

Question 15

Non-Mendelian Inheritance - Examples and Comparison

Provide examples and compare factors influencing Non-Mendelian Inheritance, emphasizing terms like Codominance and Polygenic Trait. Discuss how these examples contribute to our understanding of heredity.

flip

front

Question 16

Genetic Disorders - Vocabulary and Causes

Describe the following Genetic Disorder terms and their causes:

1. Sickle Cell Anemia
2. Cystic Fibrosis
3. Hemophilia
4. Huntington's Disease

For each matched pair, discuss how the identified cause (mutations or abnormalities in specific Genes) contributes to our understanding of heredity. Consider the following points:

- How do these genetic abnormalities get passed from one generation to the next?
- Discuss the role of Genetics in studying and understanding the transmission of these disorders.
- Explore the broader implications for Inheritance patterns within families affected by these disorders.

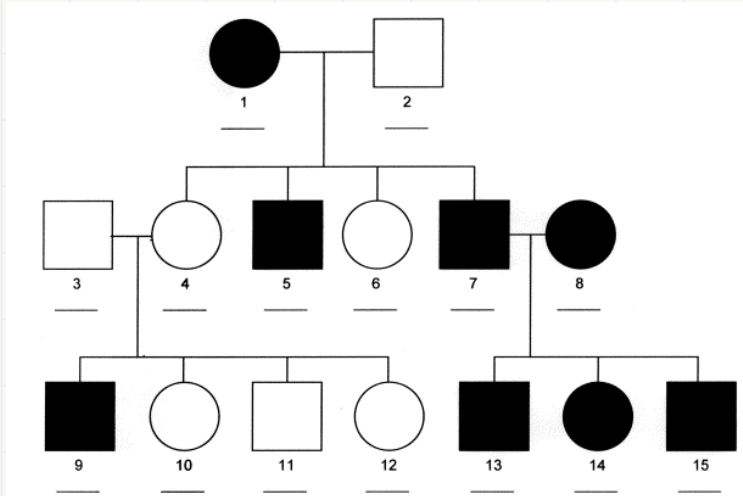
flip

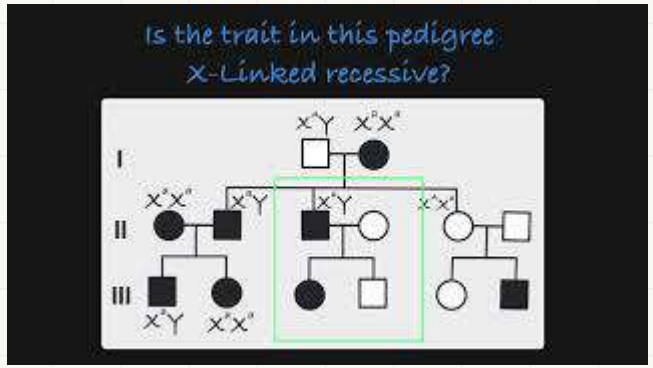
front

Question 17

Pedigree Analysis - Advanced Interpretation

Analyze a more complex Pedigree, identifying patterns of inheritance and potential carriers, using terms like X-linked Traits and Polygenic Trait.





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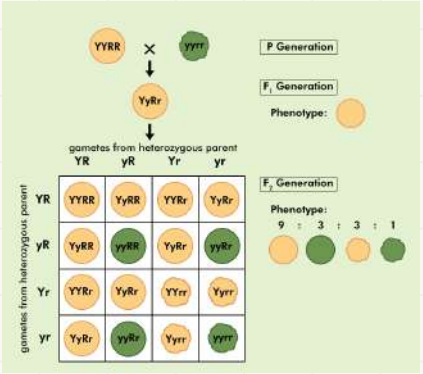
Question 18



Advanced Dihybrid Cross - Probability and Genotype Prediction

Predict the results of an Advanced Dihybrid Cross using Punnett squares and Probability Calculations, including predictions of Genotypes, Alleles,

3. Imagine that a couple is planning to have children. The male is heterozygous for tongue rolling and homozygous dominant for unattached earlobes. The female is homozygous recessive for tongue rolling and heterozygous for unattached earlobes. The couple is curious about the possibility and probability of their offspring inheriting these traits. The ability to roll ones tongue is dominant (R) over the "non-rolling" condition (r.) Unattached earlobes (U) are dominant over attached earlobes (u) Complete a Punnett square for this cross and record the probabilities for genotypes and phenotypes of the offspring as ratios.

flip

front

Question 19

X-Linked Traits - Advanced Problem Solving

Solve a complex problem involving multiple X-linked traits and predict the inheritance pattern.

Duchenne Muscular Dystrophy (DMD) is an X-linked recessive trait that causes muscular weakness, deterioration of muscle tissue, and loss of coordination. The allele for DMD is represented by X^d and the normal allele is represented by X^D.

Neither parent has DMD, but both of their sons express the trait.

What are the genotypes of the parents?

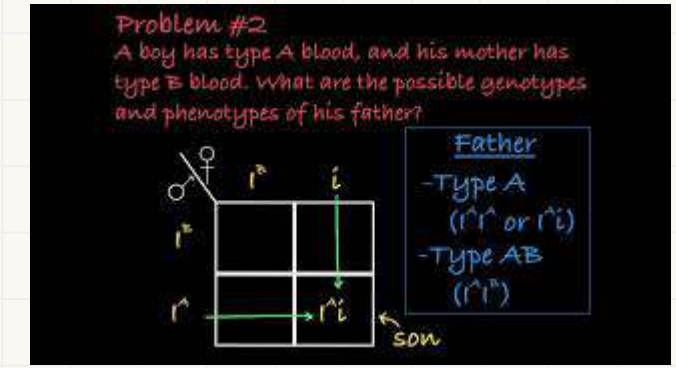
flip

front

Question 20

Advanced Monohybrid Cross / Multiple Alleles / Codominance - Probability and Genotype Prediction

Predict the results of an Advanced Monohybrid Cross using Punnett squares and Probability Calculations, including predictions of Genotypes, Alleles, and Traits.



Human blood type is determined by codominant alleles. There are three different alleles, known as IA, IB, and i. The IA and IB alleles are codominant, and the i allele is recessive.

The possible human phenotypes for blood group are type A, type B, type AB, and type O. Type A and B individuals can be either homozygous (I^AI^A or I^BI^B, respectively), or heterozygous (I^Ai or I^Bi, respectively).

A woman with type A blood and a man with type B blood could potentially have offspring with which of the following blood types?

flip

back

Answer 1

In the broader context of heredity, these terms are fundamental to understanding how traits are passed down from one generation to the next. Genes contain the instructions for building proteins that influence an organism's development and characteristics. Alleles provide the variations in these genes, contributing to the diversity within a population. The specific loci of genes on chromosomes help scientists map and study the inheritance of traits. The concepts of dominant and recessive alleles determine how traits are expressed and contribute to the complex interplay of genetics in the inheritance of traits among individuals.

flip

back

Answer 2

Gregor Mendel selected pea plants for his pioneering heredity studies due to their easily observable and distinct traits, such as seed color and plant height, controlled by a small number of genes with clear dominant and recessive alleles. The plants' self-pollinating nature facilitated controlled breeding, while their short generation time allowed Mendel to observe multiple generations swiftly. This strategic choice of experimental subject enabled Mendel to establish fundamental principles of inheritance. While focusing on simple Mendelian traits, Mendel's work laid the groundwork for understanding more complex genetic disorders and traits, showcasing the significance of his pea plant experiments in advancing the understanding of heredity.

flip

back

Answer 3

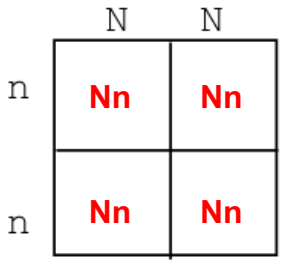
The Law of Segregation and the Law of Independent Assortment are pivotal concepts in the broader context of heredity, highlighting fundamental principles governing the transmission of traits from one generation to the next. The Law of Segregation posits that each individual possesses two alleles for a given trait, inherited from each parent, and during gamete formation, these alleles segregate or separate, ensuring that each gamete carries only one allele. This principle underscores the diversity of genetic combinations in offspring. In tandem, the Law of Independent Assortment states that alleles for different traits assort independently during gamete formation, emphasizing the random assortment of genes on nonhomologous chromosomes. Together, these laws illuminate the intricate mechanisms guiding the inheritance of traits and contribute to our understanding of the rich variability observed in populations over successive generations.

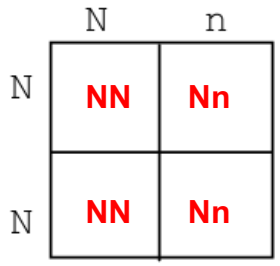
flip

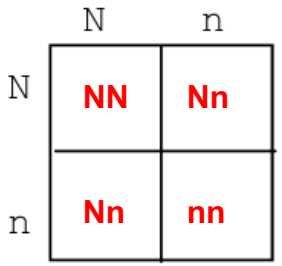
back

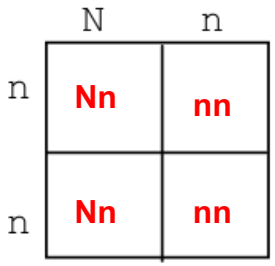
Answer 4

Understanding the significance of genotype and phenotype is crucial in unraveling hereditary outcomes. The genotype represents the genetic composition of an organism, encompassing the specific alleles inherited for a particular trait. It serves as the underlying blueprint that influences the phenotype, which is the observable manifestation of those genetic instructions. The interplay between genotype and phenotype is central to comprehending how traits are expressed in individuals. While genotype determines the potential range of phenotypic outcomes, environmental factors can also influence phenotype expression. Recognizing and studying both genotype and phenotype allows researchers and scientists to delve into the intricacies of heredity, providing insights into the inheritance patterns of traits and the broader dynamics shaping the characteristics of living organisms.









flip

back

Answer 5

In terms such as Incomplete Dominance, Codominance, and Recessive are pivotal in unraveling the complexities of Genetic Disorders. Incomplete Dominance occurs when neither allele in a gene pair dominates the other, resulting in an intermediate phenotype. Codominance, on the other hand, showcases the simultaneous expression of both alleles, contributing to a distinct phenotype that incorporates traits from both. In the realm of Genetic Disorders, these concepts illuminate the nuanced ways in which genes interact, potentially influencing the severity or manifestation of disorders. Understanding the role of recessive alleles is equally critical, as they often underlie the inheritance of certain genetic disorders, expressing themselves when an individual inherits two copies. This nuanced exploration of genetic interactions provides a comprehensive framework for comprehending the intricacies of Genetic Disorders within the broader landscape of heredity.

flip

back

Answer 6

1. In fruit flies, red eyes are dominant over brown eyes. You manage to capture a red-eyed fruit fly and desire to learn more about its genotype.

a. Give the **phenotypes** (physical eye color) of the flies involved in your test-cross:

B _ x bb

b. If the two flies have 400 offspring that all turn out to be red-eyed, what would be the **genotypes** of the flies used in your test-cross? (Use "R" and "r")

B B x bb

Complete the cross on the right:

	b	b
B	Bb	Bb
B	Bb	Bb

What percentage is heterozygous? = 100 %

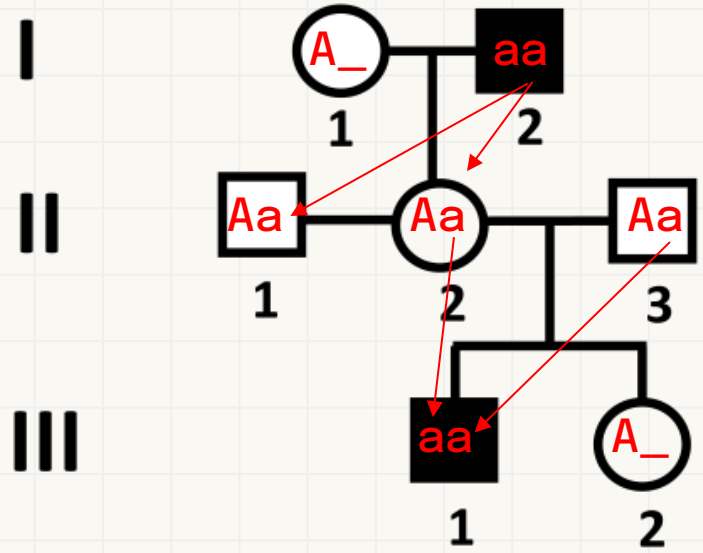
What percentage shows the dominant trait? = 100 %

c. If you performed the same experiment but this time 200 of the 400 flies had brown eyes, what would be the genotype of the red-eyed fly? B b

flip

back

Answer 7



Autosomal Recessive

flip

back

Answer 8

Examining the broader context of heredity, terms such as Incomplete Dominance, Codominance, and Polygenic Traits play crucial roles in shaping and understanding Non-Mendelian Inheritance. In instances of Incomplete Dominance, neither allele dominates, leading to an intermediate phenotype. Codominance involves the simultaneous expression of both alleles, contributing to a phenotype that reflects both traits. Polygenic Traits, determined by multiple genes, introduce a layer of complexity to inheritance patterns. Together, these concepts challenge the simplicity of Mendelian genetics, illustrating the multifaceted nature of genetic inheritance. Non-Mendelian Inheritance, characterized by these phenomena, underscores the importance of considering diverse genetic interactions in shaping an individual's traits, fostering a more comprehensive understanding of heredity beyond traditional Mendelian principles.

flip

back

Answer 9

2. A male rabbit with the genotype GGbb is crossed with a female rabbit with the genotype ggBb the square is set up below. Fill it out and determine the phenotypes and proportions in the offspring.

	Gb	Gb	Gb	Gb
gB	GgBb	GgBb	GgBb	GgBb
gB	GgBb	GgBb	GgBb	GgBb
gb	Ggbb	Ggbb	Ggbb	Ggbb
gb	Ggbb	Ggbb	Ggbb	Ggbb

How many out of 16 have gray fur and black eyes? _____ 8

How many out of 16 have gray fur and red eyes? _____ 8

How many out of 16 have white fur and black eyes? _____

How many out of 16 have white fur and red eyes_____

flip

back

Answer 10

Distinguishing between Genotype and Phenotype is essential when considering genetic traits. Genotype refers to the specific genetic makeup of an organism, encompassing the combination of alleles inherited for a particular trait. It serves as the genetic code that influences the traits an individual can potentially express. In contrast, Phenotype represents the observable characteristics or traits of an organism, influenced by its genotype and interactions with the environment. While the genotype sets the stage for the potential range of traits, the phenotype is the manifestation of those genetic instructions. This differentiation between genotype and phenotype is fundamental in comprehending how genetic information translates into observable traits in living organisms.

flip

back

Answer 11

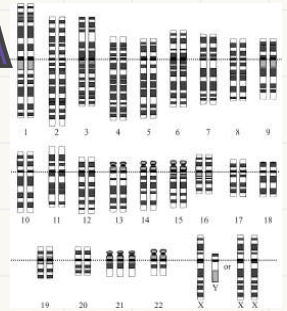
Applying the Law of Segregation allows us to predict the inheritance of a specific trait within a family. According to this law, each individual possesses two alleles for a given trait, and during gamete formation, these alleles segregate or separate, ensuring that each gamete carries only one allele. For instance, consider a family where both parents carry a recessive allele for a particular trait, while outwardly expressing a dominant trait. If both parents pass on the recessive allele to their offspring, the child will manifest the recessive trait. This example contributes significantly to our understanding of heredity by demonstrating how the principles of segregation govern the transmission of genetic information from one generation to the next. It underscores the predictability of inheritance patterns and provides insights into the factors influencing the expression of traits in a familial context.

flip

back

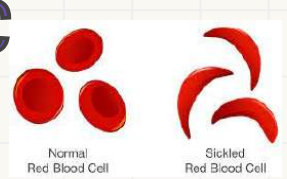
Answer 12

A

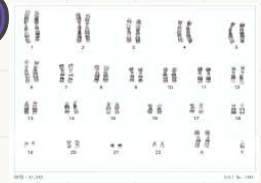


B

C



D



Identifying Genetic Disorders based on specific traits allows us to comprehend associated phenotypes and explore the indicative nature of hereditary factors. For Down syndrome, characterized by an extra copy of chromosome 21, individuals typically exhibit distinctive facial features, intellectual disabilities, and developmental delays. Sickle cell disease, a result of a mutated hemoglobin gene, manifests as abnormal red blood cells causing pain, anemia, and organ damage. Marfan syndrome, associated with a mutation in the FBN1 gene, leads to tall stature, elongated limbs, and cardiac complications. Klinefelter syndrome, arising from an extra X chromosome in males, results in reduced testosterone production, infertility, and sometimes developmental challenges. These disorders exemplify how specific genetic variations contribute to observable traits, emphasizing the significant role of hereditary factors in shaping health outcomes.

flip

back

Answer 13

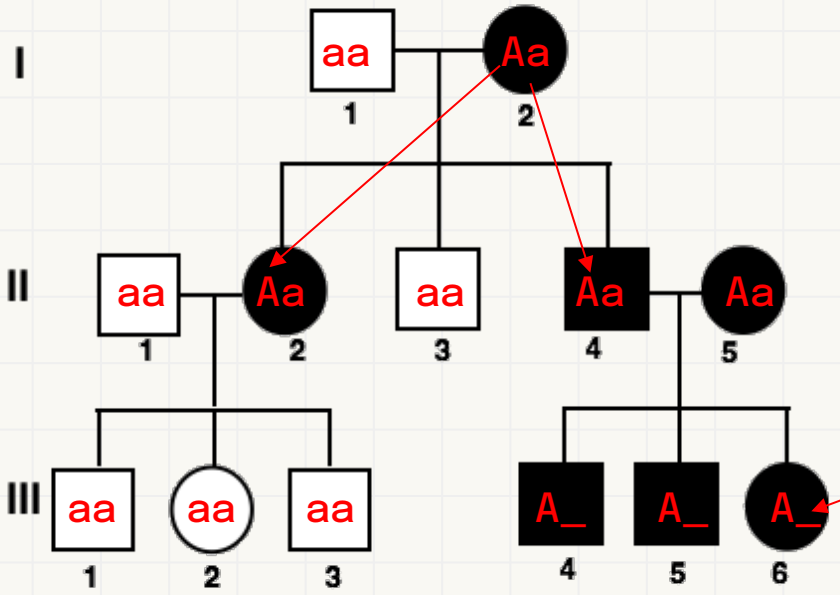
AaBB x aaBb

1. AABB - yes, one allele combination from each parent
2. Aabb - no, no b's from each parent
3. aaBb - yes, one allele combination from each parent
4. AAbb - no b's nor A's from each parent
5. AABb - no A's from each parent

flip

back

Answer 14



Autosomal Dominant

A or a

flip

back

Answer 15

Offering examples and drawing comparisons, let's explore the factors influencing Non-Mendelian Inheritance, with a focus on terms such as Codominance and Polygenic Traits. Codominance, exemplified in blood type inheritance, showcases the simultaneous expression of both alleles, resulting in distinct blood types like AB. Polygenic Traits, observed in traits influenced by multiple genes, such as skin color, emphasize the additive effects of multiple genetic factors. These examples contribute significantly to our understanding of heredity by challenging the simplicity of Mendelian genetics. They illustrate the complexity inherent in genetic interactions, providing insights into how traits are shaped by a combination of genes, ultimately fostering a more nuanced comprehension of hereditary patterns and variability within populations.

flip

back

Answer 16

Sickle Cell Anemia, Cystic Fibrosis, Hemophilia, and Huntington's Disease illuminate distinct genetic disorders, each rooted in mutations within specific genes. The autosomal recessive inheritance of Sickle Cell Anemia requires both parents to carry and transmit the defective HBB gene, while Cystic Fibrosis results from mutations in CFTR and follows a similar inheritance pattern. Hemophilia, associated with impaired blood clotting due to mutations in F8 or F9, typically follows X-linked recessive inheritance. In contrast, Huntington's Disease, linked to a mutated HTT gene, exhibits autosomal dominant inheritance. Genetics plays a vital role in understanding the transmission of these disorders, employing tools like genetic testing and family pedigrees. The broader implications for inheritance patterns highlight the significance of genetic counseling, guiding affected families in informed decision-making and potential interventions. Recognizing these genetic factors not only enhances our comprehension of heredity but also contributes to developing strategies for managing and addressing the impact of these disorders within affected families.

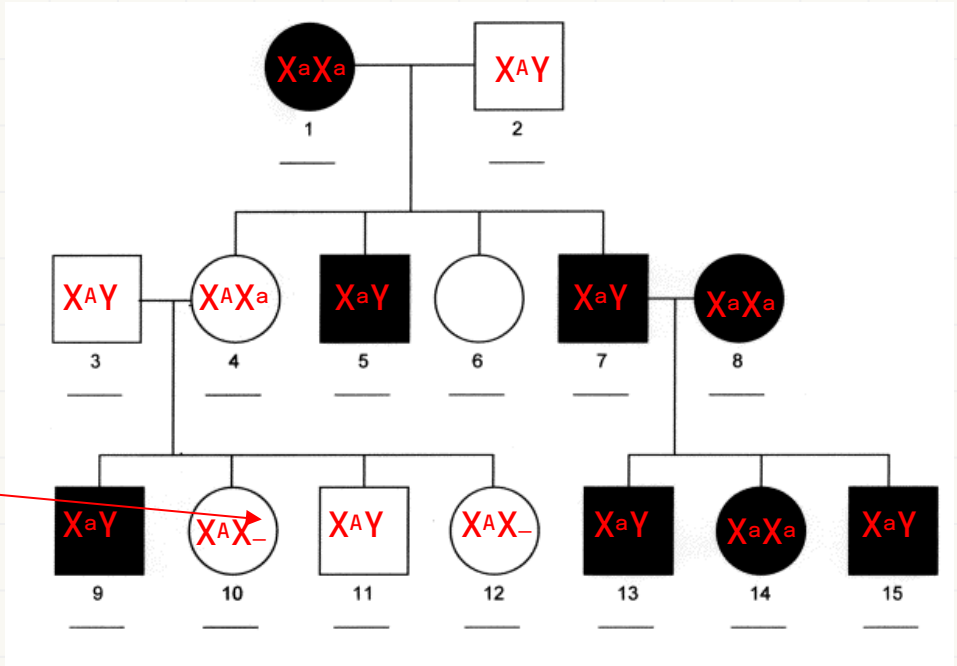
flip

back

Answer 17

X-Linked
Recessive

A or a



flip

back

Answer 18

	rU	ru	rU	ru
RU	RrUU	RrUu	RrUU	RrUu
RU	RrUU	RrUu	RrUU	RrUu
rU	rrUU	rrUu	rrUU	rrUu
rU	rrUU	rrUu	rrUU	rrUu

RrUU x rrUu

- R_U: 8/16
- rrU_: 8/16
- R_uu:
- rruu

3. Imagine that a couple is planning to have children. The male is heterozygous for tongue rolling and homozygous dominant for unattached earlobes. The female is homozygous recessive for tongue rolling and heterozygous for unattached earlobes. The couple is curious about the possibility and probability of their offspring inheriting these traits. The ability to roll ones tongue is dominant (R) over the "non-rolling" condition (r.) Unattached earlobes (U) are dominant over attached earlobes (u) Complete a Punnett square for this cross and record the probabilities for genotypes and phenotypes of the offspring as ratios.

flip

back

Answer 19

Duchenne Muscular Dystrophy (DMD) is an X-linked recessive trait that causes muscular weakness, deterioration of muscle tissue, and loss of coordination. The allele for DMD is represented by X^d and the normal allele is represented by X^D.

Neither parent has DMD, but both of their sons express the trait.

What are the genotypes of the parents?

Daughter will be normal or a carrier each time - 50/50

	X^D	X^d
X^D	X^DX^D	X^DX^d
Y	X^DY	X^dY

Son will be normal or affected each time - 50/50

flip

back

Answer 20

Human blood type is determined by codominant alleles. There are three different alleles, known as IA, IB, and i. The IA and IB alleles are codominant, and the i allele is recessive.

The possible human phenotypes for blood group are type A, type B, type AB, and type O. Type A and B individuals can be either homozygous (I^AI^A or I^BI^B, respectively), or heterozygous (I^Ai or I^Bi, respectively).

A woman with type A blood and a man with type B blood could potentially have offspring with which of the following blood types?

	I^B	I^B / i
I^A	I^AI^B	I^AI^B or I^Ai
I^A / i	I^AI^B or I^Bi	I^AI^B or ii

AB

A

B

O

flip