Multiple alleles and polygenic traits answers

I'm not robot!

Codominance PRACTICE

1. A black ($F^B F^B$) feather chicken is crossed with a white ($F^W F^W$) feathered chicken.

a. Identify the phenotype ratio of the offspring.

b. Identify the genotype ratio of the offspring.

2. A black ($F^B F^B$) feathered chicken is crossed with a black and white ($F^B F^W$) feathered chicken.

a. Identify the phenotype ratio of the offspring.

b. Identify the genotype ratio of the offspring.

3. A black and white ($F^B F^W$) feathered chicken is crossed with a white ($F^W F^W$) chicken.

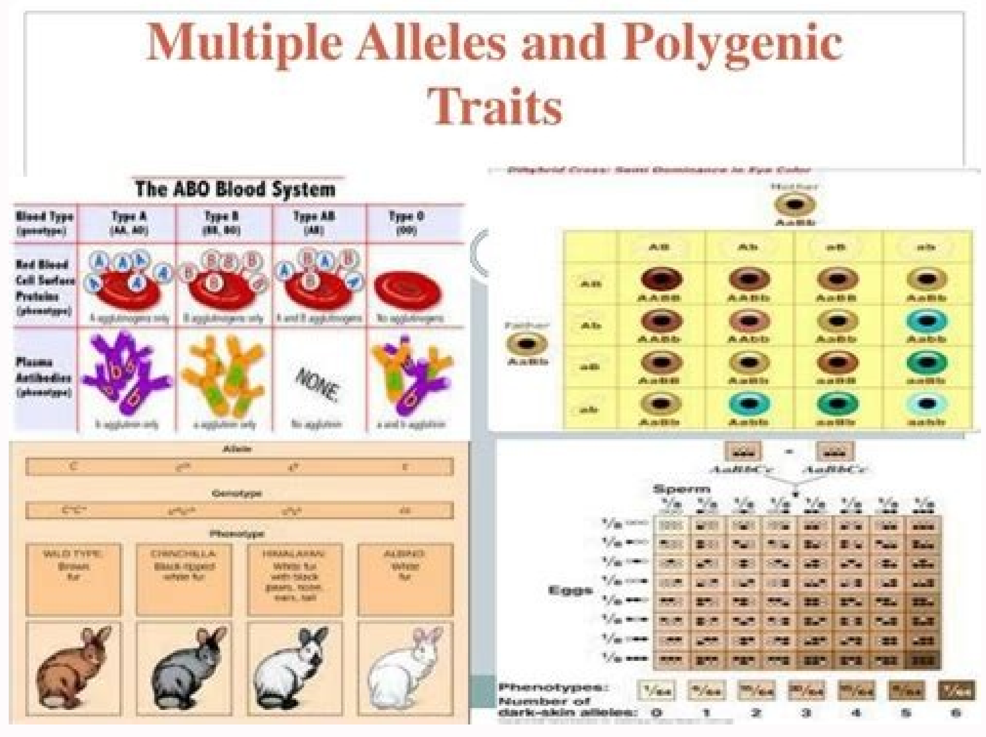
a. Identify the phenotype ratio of the offspring.

b. Identify the genotype ratio of the offspring.

4. A black and white ($F^B F^W$) feathered chicken is crossed with a black and white ($F^B F^W$) feathered chicken.

a. Identify the phenotype ratio of the offspring.

b. Identify the genotype ratio of the offspring.



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Quiz & Worksheet - Epistasis Gene Interactions

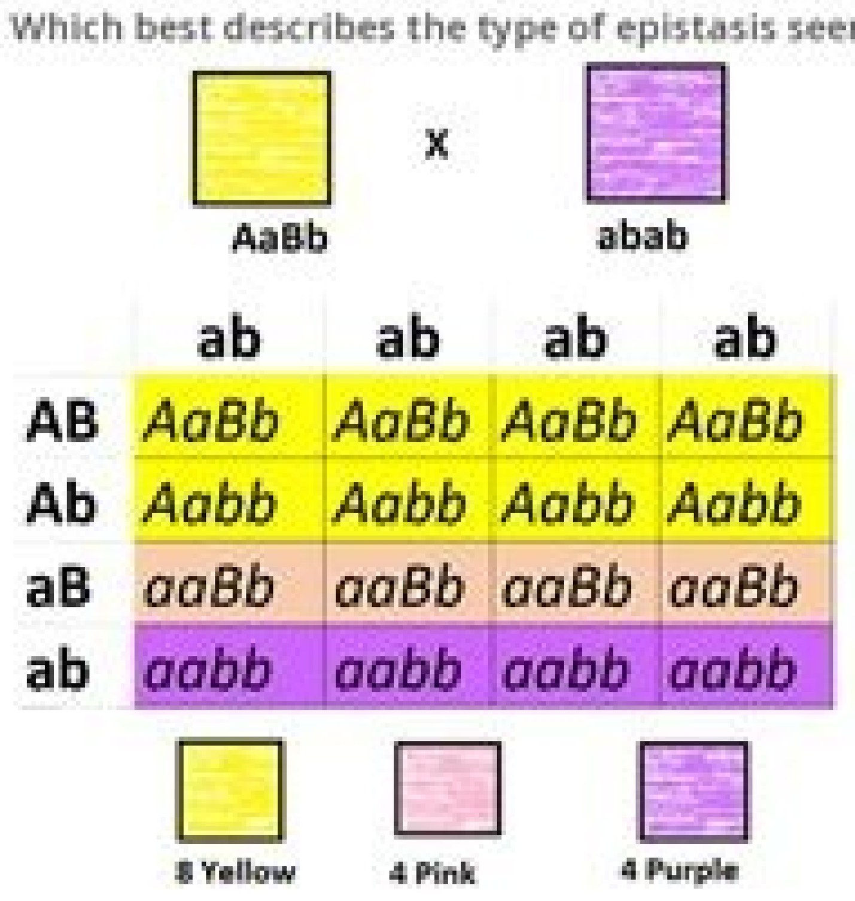
1. Which best describes epistasis?

- An allele that changes the genotype of another allele
- A gene that changes the genotype of another gene
- An allele that controls or masks the expression of another allele
- A gene that controls or masks the expression of another gene

2. Given what you know about albinism, what are the chances that the two mice below have an albino child? The trait for albinism is encoded by GeneA.

- 100%: The trait shows dominant epistasis, and only one allele is needed to inherit the trait.
- 75%: The trait shows dominant epistasis, which has a 12:3:1 ratio.
- 25%: The trait shows recessive epistasis, which has a 9:4:3 ratio.
- 0%: The trait shows recessive epistasis - two alleles must be inherited for albino offspring.

3. Which best describes the type of epistasis seen in the image below?



- Recessive epistasis - When all recessive alleles are present, purple squares are present.
- Dominant epistasis - Whenever there is an 'A' allele present, yellow squares are produced regardless of whether 'Bb' or 'bb' alleles are present.
- Dominant epistasis - When a 'B' allele is present, the squares are not purple.
- There is not enough information to answer the question.

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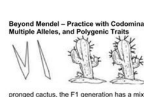
Beyond Mendel – Practice with Codominance, Lethal Genes, Multiple Alleles, and Polygenic Traits



1. In a certain cactus, prickly spines can be two pronged or one pronged. If a true breeding one-pronged cactus is crossed with a true breeding two-pronged cactus, the F1 generation has a mixture of spines, some are two-pronged, some are one-pronged.
a. Is this an example of codominance or incomplete dominance?
b. Show the F2 generation (a cross between the two F1's). What are the phenotypes of the offspring and in what proportion?
2. In this same cactus, purple flowers are dominant to yellow flowers. A cactus that has both two-pronged and one-pronged spines has yellow flowers is crossed with a two-pronged cactus with purple flowers (heterozygous).
What are the phenotypes of the offspring?

3. In mice, the spinning behavior is caused by a dominant gene that affects the mouse's equilibrium. This gene is lethal if two alleles are present. Two "spinning mice" are mated together.
Show the cross. What are the phenotypes of the offspring and in what proportion? (Be sure to eliminate any offspring that do not survive.)

4. A nurse at a hospital removed the wrist tags of three babies in the maternity ward. She needs to figure out which baby belongs to which parents, so she checks their blood types. Using the chart below, match the baby to its correct parents. Show the crosses to prove your choices.

Key Concepts

In **codominance,** both alleles are expressed equally in the phenotype of the heterozygote. For example, red cows crossed with white cows will have offspring that are roan cows. Roan refers to cows with red hair and white blotches.

*Many genes have multiple alleles. An example is **ABO blood type** in humans.*

1. Multiple Alleles (adapted from Grade 8 Learner's module –since non-Mendelian is not included in the learning competency)

Sometimes, even if only two alleles control a trait, there may actually be more than two types of alleles available. This will also lead to more than two phenotypes expressed. Another blood group system in humans, the ABO system, is an example of a character governed by multiple alleles. Three alleles are responsible for this blood system: I^A, I^B, and *i*. The ABO blood type is determined by the presence or absence of two antigens, A and B. Allele *i* does not code for an antigen. There are four possible blood types as shown in Table 2.

Table 2. Human ABO blood types and their phenotypes.

Blood Types	Genotypes
A	$I^A I^A$, $I^A i$
B	$I^B I^B$, $I^B i$
AB	$I^A I^B$
O	*ii*

The I^A and I^B alleles are dominant over the i allele, which is always recessive. However, when the I^A and I^B alleles are inherited together, both alleles are expressed equally. This also makes I^A and I^B codominants of each other.

- What is your blood type? Do you know your blood type? What are your parents' blood types?

What are the characteristics of multiple alleles. Multiple alleles and polygenic traits 11.3 answers. Multiple alleles and polygenic traits worksheet answers.

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Math in simple phrases is often everything simple to instruct, but in relation to instructing the more difficult theories of mathematics, around 3rd class, it could be a somewhat more challenging to keep the students intrigued. It can be even more complicated to put into action methods for educating that can help students know the concepts of multiplication with out obtaining baffled. Multiple Alleles And Polygenic Traits Uploaded by admin on Wednesday, November 25th, 2020 in category Printable Multiplication. See also Multiple Allele Crosses & Polygenic Inheritance from Printable Multiplication Topic. Here we have another image featured under Multiple Alleles And Polygenic Traits. We hope you enjoyed it and if you want to download the pictures in high quality, simply right click the image and choose "Save As". Thanks for reading Multiple Alleles And Polygenic Traits. Home Subjects Math Science History Arts & Humanities Social Studies Engineering & Technology Business Other Resources Study Guides Leaderboard All Tags Unanswered Random Tags Science Home Subjects Math Science History Arts & Humanities Social Studies Engineering & Technology Business Other Categories Chemistry Biology ⚛ Physics Earth Science Astronomy Zoology General Science Resources Study Guides Leaderboard All Tags Unanswered Random Tags Genetics Biology Multiple Choice Questions on "Polygenic Inheritance". 1. What kinds of traits were described by Mendel?a) Contrasting traitsb) Alternative formsc) Mixed formsd) Opposite and recessive formsAnswer: aClarification: Through the experiments of pea conducted by Mendel, he described distinct contrasting traits such as flower colour which are either purple or white. 2. What are polygenic traits?a) Traits controlled by a single geneb) Traits not controlled by any genesc) Traits controlled by two genesd) Traits controlled by three or more genesAnswer: dClarification: Traits are the feature of a character by which we can distinguish organisms. Traits which are generally controlled by three or more genes are known as polygenic traits. 3. Which of the following is a classic example of polygenic inheritance?a) Skin colour in humansb) Blood groupsc) Flower colour in peasd) Stem height in peasAnswer: aClarification: Skin colour in humans is a classic example of polygenic inheritance as this trait is controlled by three or more genes and we can see that this trait is not so distinct amongst the human population and is spread across a gradient. 4. In humans, only tall and short people exist.a) Trueb) FalseAnswer: bClarification: Height of humans is a polygenic trait and is therefore not limited to only tall and short people. Instead of two distinct alternative traits, a range of all the possible heights is present in a human population. 5. What are polygenes?a) Genes involved in quantitative inheritanceb) Genes involved in the qualitative inheritancec) Genes involved in multiple allelismd) Multiple genes for a single traitAnswer: aClarification: Genes which are involved in quantitative inheritance are called as polygenes. In quantitative inheritance, each dominant allele expresses itself as a part of functional polypeptide and the full trait is shown when all the dominant alleles are present in an organism. 6. Which of the following scientists demonstrated the quantitative traits in wheat?a) Ernst Haeckelb) H. Nilsson-Ehlec) Westd) Paul VincentAnswer: bClarification: H. Nilsson-Ehle in 1908 and East in 1910 demonstrated the segregation and assortment of genes that controlled the quantitative traits, e.g., Kernel colour in wheat and corolla length in tobacco. 7. Which two varieties of wheat were crossed by H. Nilsson to study the kernel colour in wheat?a) Red and black kernelled varietyb) Red and white kernelled varietyc) White and black kernelled varietyd) Black and blue kernelled varietyAnswer: bClarification: In order to study the kernel colour of wheat, H. Nilsson crossed red kernelled variety with a white kernelled variety of wheat. He found out that the kernel colour in wheat is determined by AA and BB genes. 8. What was the ratio of F2 generation when red and white kernelled variety of wheat were crossed?a) 1: 2: 1b) 9: 3: 3: 1c) 1: 4: 6: 4: 1d) 3: 1Answer: cClarification: The ratio of F2 generation when red and white kernelled wheat varieties were crossed was obtained as-1: 4: 6: 4: 1. Also, five different phenotypic classes were obtained. 9. Which of the following is not a phenotypic class of the F2 generation in wheat?a) Extreme redb) Deep redc) Blackd) WhiteAnswer: cClarification: The five phenotypic classes obtained while crossing red and white kernelled wheat variety are: the extreme red, deep red, intermediate red, light red and white. 10. On which of the following factor, the degree of redness of progenies depend?a) Number of dominant allelesb) Number of recessive allelesc) Number of contrasting traitsd) Number of phenotypic charactersAnswer: aClarification: When we crossed a red and white kernelled variety of wheat, we saw that all the red kernels do not exhibit the same shade of redness. The degree of redness was found to depend upon the number of dominant alleles. 11. On how many loci the genes responsible for skin colour are present?a) Twob) Threec) Fourd) FiveAnswer: bClarification: The three pair of genes which determine the skin colour in humans are present at three different loci and each dominant allele of that gene is responsible for the amount of melanin pigment in the skin. 12. On which of the following factors, the amount of melanin produced depends?a) Number of recessive allelesb) Number of chromosomes present in an individualc) Number of dominant genesd) Number of loci present in DNAAnswer: cClarification: The amount of melanin produced in the skin of humans is always proportional to the number of dominant genes. The effect of all the genes that are responsible for the skin colour is additive. 13. Davenport showed that six pairs of genes are involved in controlling the skin colour in humans.a) Trueb) FalseAnswer: bClarification: Davenport was a scientist who demonstrated that six genes are involved in controlling the skin colour in human beings. He also showed that skin colour can only be studied in a population. 14. Which of the following curves can be a representation of the skin colour in a population?a) Sigmoid curveb) An ellipsec) Histogramd) J-shaped curveAnswer: cClarification: We can study the frequency distribution of skin colour in the form of a bell-shaped normal distribution curve which is also represented by a Histogram. 15. Which of the following conclusions can be made by studying a histogram?a) Extreme phenotypes are commonb) Intermediate phenotypes are more frequentc) Intermediate phenotypes are rared) All phenotypes are present in equal amountsAnswer: bClarification: We can draw two conclusions by studying a histogram. These are that in a polygenic inheritance, the extreme phenotypes are rare and the intermediate ones are more frequent. 16. Which of the following is not an example of quantitative trait?a) Cob length in maizeb) Height in humansc) Human intelligenced) Blood groups in humansAnswer: dClarification: Cob length in maize, height in humans, human intelligence, milk and meat production, height in humans and size, shape and number of seeds and fruits in plants are some of the common examples of quantitative traits. Loading... Multiple alleles and polygenic traits are two types of non-Mendelian inheritance patterns where many factors are involved in determining a particular trait. In Mendelian inheritance, only two factors are involved in the determination of a particular trait. Multiple alleles are more than two alternative forms of a single gene, which are located at the same loci of homologous chromosomes. Polygenic traits are determined by several genes. The main difference between multiple alleles and polygenic traits is that multiple alleles are involved in the determination of a single trait by complete dominance or codominance whereas polygenic traits determine a particular trait in a population by codominance or incomplete dominance of each polygene. Key Areas Covered 1. What are Multiple Alleles – Definition, Features, Examples 2. What are Polygenic Traits – Definition, Features, Examples 3. What are the Similarities Between Multiple Alleles and Polygenic Traits – Outline of Common Features 4. What is the Difference Between Multiple Alleles and Polygenic Traits – Comparison of Key Differences Key Terms: Blood Types, Codominance, Complete Dominance, Dominant Alleles, Homologous Chromosomes, Incomplete Dominance, Multiple Alleles, Non-Mendelian inheritance, Polygenic Traits, Recessive Alleles What are Multiple Alleles Multiple alleles are the alternative forms of a gene when a particular gene comprises more than two alleles. Typically, every gene comprises two alternative forms: the dominant allele and the recessive allele. However, some genes comprise more than two alleles. Multiple alleles are situated at the same locus of homologous chromosomes. Homologous crossing over does not occur between homologous chromosomes containing alleles of the same gene. The influence of multiple alleles is on a single trait. Comprising of multiple alleles for a particular gene is a type of non-Mendelian inheritance pattern. Multiple alleles may produce either codominance or incomplete dominance patterns. Thus, a mixture of phenotypes can be visible in the offspring. A mixed type of dominant phenotypes can be observed in codominance while a blend of phenotypes can be observed in incomplete dominance. Figure 1: Inheritance of ABO blood types The human blood type is determined by multiple alleles. Four blood types can be identified in humans: type A, type B, type AB, and type O. Three allele types are involved in determining the blood type; IA, IB, and i. The type A blood is determined by the combination of two alleles, IAIA or IAi. The type B blood is determined by the combination of two alleles, IBIB or IBi. The type AB blood, which is determined by a combination of IAIB alleles, is an example of codominance in which both IA and IB alleles are expressed in equal dominance. The type O blood is determined by the combination of two recessive alleles, ii. The type A, B, and O are examples of complete dominance that follows Mendel's Laws of inheritance. The inheritance of ABO blood types in humans is shown in figure 1. A trait that is controlled by more than one gene is referred to as a polygenic trait. Each gene is located in different loci of different chromosomes. Polygenic traits are a type of non-Mendelian inheritance. The polygenic traits show a continuous variation of the character. Thus, polygenes show incomplete dominance. The distribution curve of the polygenic inheritance is bell-shaped. Polygenes show a great significance in evolution since they produce many different genotypes. The polygenic traits highly depend on external environmental factors. Figure 2: Human eye color The kernel color in wheat and corolla length in tobacco are examples of polygenic traits in plants. Most of the quantitative traits such as the height, weight, body shape, behavior, intelligence, eye color, skin color, and hair color of humans are controlled by polygenes. Sixteen different genes are involved in determining the amount of melanin produced in the iris of the eye, which ultimately produces the color of the eye. Depending on the amount of melanin produced in the iris, different eye colors can be identified among humans such as black, brown, green, hazel, and blue. The hazel color eyes are shown in figure 2. Similarities Between Multiple Alleles and Polygenic Traits Both multiple alleles and polygenic traits are the examples of non-Mendelian inheritance patterns. More than two factors are involved in the determination of a trait in multiple alleles and polygenic traits. Difference Between Multiple Alleles and Polygenic Traits Definition Multiple Alleles: Multiple alleles refer to a series of three or more alternative forms of a gene. Polygenic Traits: Polygenic trait is a trait that is controlled by a group of nonallelic genes. Presence in an Individual Multiple Alleles: Only two types of alleles are present in an individual; multiple alleles can be found within the population. Polygenic Traits: All polygenes can be found in the individual. Number of Genes Involved Multiple Alleles: Only one gene consists of more than two alleles. Polygenic Traits: In polygenic traits, many genes control a single trait. Mechanism Multiple Alleles: Multiple alleles determine a trait by complete dominance or codominance. Polygenic Traits: Polygenic traits determine a trait by codominance or incomplete dominance. Influence of the Environmental Factors on a Trait Multiple Alleles: Environmental factors have no influence in the determination of a trait by multiple alleles. Polygenic Traits: Environmental factors have a higher influence in the determination of a trait by polygenes. Location Multiple Alleles: Multiple alleles are located at the same loci of homologous chromosomes. Polygenic Traits: The polygenes are located at different loci of non-homologous chromosomes. Crossing Over Multiple Alleles: Homologous crossing over does not occur between the loci of multiple alleles. Polygenic Traits: Homologous crossing over can occur between the two alleles of each polygene. Qualitative/Quantitative Multiple Alleles: Multiple alleles determine qualitative traits. Polygenic Traits: Polygenic traits determine quantitative traits. Variation in a Population Multiple Alleles: Multiple alleles does not show any variation of the trait in a population. Polygenic Traits: Polygenic traits show a continuous variation of the trait in a population. Examples Multiple Alleles: The ABO blood type of humans is an example of a trait determined by multiple alleles. Polygenic Traits: The kernel color in wheat and corolla length in tobacco are the examples of polygenic traits in plants. The height, weight, body shape, behavior, intelligence, eye color, skin color, and hair color of humans are polygenic traits. Conclusion Multiple alleles and polygenic traits are two types of non-Mendelian inheritance. Thereby, more than two factors are involved in the determination of a trait in both multiple alleles and polygenic traits. Multiple alleles are more than two alternative forms of a gene, located at the same loci of homologous chromosomes. In polygenic traits, several genes are involved in determining a single trait. Multiple alleles follow complete dominance or codominance while polygenic traits follow codominance or incomplete dominance. Therefore, a continuous variation of a trait can be found in a population in polygenic traits. The main difference between multiple alleles and polygenic traits is the mechanism of inheritance of characters in multiple alleles and polygenic traits. Reference: 1. Scoville, Heather. "Learn About Multiple Alleles." ThoughtCo. N.p., n.d. Web. Available here. 14 July 2017. 2. "Multiple Alleles: Meaning, Characteristics and Examples | Genes." Biology Discussion. N.p., 12 July 2016. Web. Available here. 14 July 2017. 3. "Polygenic Traits: Introduction, Features and Analysis | Genetics." Biology Discussion. N.p., 12 July 2016. Web. Available here. 14 July 2017. 4. "What are Polygenic Traits?" Bright Hub. N.p., 30 July 2010. Web. Available here. 14 July 2017. 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