

ALIEN FAMILY GENETICS PROJECT

Purpose: To show your understanding that...

- In sexual reproduction, half of an offspring's genes come from each parent. Sexually produced offspring are not identical to parents.
- Some traits are controlled by **dominant and recessive alleles**.
- Some traits are controlled by **incomplete dominance** or **codominance**.
- The chances of traits being expressed in offspring can be determined using **Punnett squares** and **pedigree charts**.

Final product: Students will design an alien family with genotypes and phenotypes that match the probability charts that were created by their groups.

To demonstrate your understanding you will...

7.L.2.1 **Explain** why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation than offspring that result from asexual reproduction (budding and mitosis).

7.L.2.2 **Infer** patterns of heredity using information from Punnett squares and pedigree analysis.

7.L.2.3 **Explain** the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.

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PART 1 (DOMINANT & RECESSIVE TRAITS)

Directions: Fill in the table with possible traits that your alien family may end up having. As a group, decide the **dominant** and **recessive traits** that relate to each trait (you will decide which trait will be dominant and which will be recessive).

A few examples of the alien traits are given in the chart below. Your group must fill in the chart with new traits. For each trait choose a letter of the alphabet to represent it. Put a capital of the letter chosen in parentheses next to the dominant trait and a lower case of that letter next to the recessive trait. For example, for the eye color trait we choose the letter “e” to represent this trait. A capital “E” was written in parentheses next to the dominant trait (black eyes) and a lower case “e” is written next to the recessive trait (colorful eyes).

Once your group filled in the chart with new traits, your group should put a star next to the six traits that your group wants your alien's phenotype to show (your group can choose from the traits already given as well.) Everyone must choose eye color as one of their traits.

TABLE #1:

[illegible]

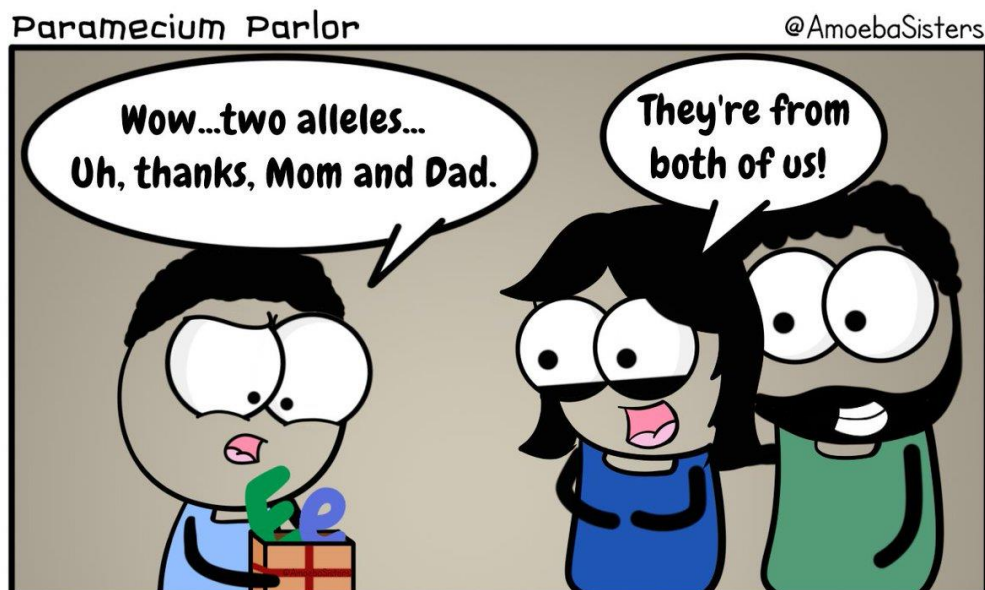
ALIEN FAMILY GENETICS PROJECT PART 2 (PHENOTYPE & GENOTYPE)

Directions: Copy three of the six traits that your group starred in table #1 to table #2. These traits will be inherited by dominant or recessive alleles. Fill in the chart by identifying the phenotype and genotype for each trait.

Remember that **genotype** is the set of genes in our DNA which is responsible for a particular trait. **Phenotype** is the physical expression, or characteristics, of that trait. Each possible genotype has two **alleles**. One from each parent!

TABLE #2:

Trait	Dominant	Recessive
Example: Eye Color	Phenotype: Black eyes Genotype: EE, Ee	Phenotype: Colorful eyes Genotype: ee
	Phenotype: Genotype:	Phenotype: Genotype:
	Phenotype: Genotype:	Phenotype: Genotype:
	Phenotype: Genotype:	Phenotype: Genotype:



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PART 3 (INCOMPLETE DOMINANCE & CO-DOMINANCE)

Directions: You should now have two starred traits from table #1 that you have not copied into table #2. Write one of those traits into table #3 and the other into table #4.

Incomplete dominance results in a phenotype that is a blend of a heterozygous allele pair. For example, a red flower breed with a blue flower could make a purple flower if the plant had a heterozygous (two different alleles) genotype.

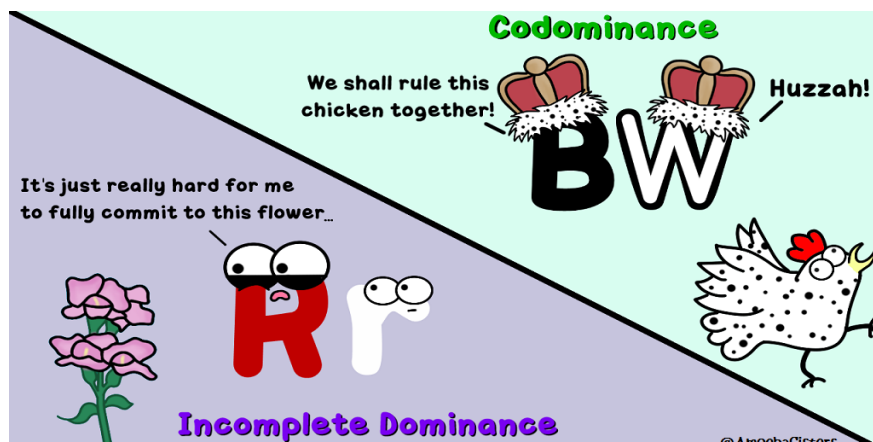
TABLE #3:

Trait			
Example: Flower Color	Phenotype: Red flower Genotype: FF	Phenotype: Purple flower Genotype: Ff	Phenotype: Blue flower Genotype: ff
	Phenotype: Genotype:	Phenotype: Genotype:	Phenotype: Genotype:

Co-dominance results in a phenotype that shows both traits of an allele pair. For example, a red flower breed with a blue flower could make a red AND blue flower if the plant had a heterozygous (two different alleles) genotype.'

TABLE #4:

Trait			
Example: Flower Color	Phenotype: Red flower Genotype: FF	Phenotype: Red and blue flower Genotype: Ff	Phenotype: Blue flower Genotype: ff
	Phenotype: Genotype:	Phenotype: Genotype:	Phenotype: Genotype:



ALIEN FAMILY GENETICS PROJECT PART 4 (THE PARENTS)

Directions: Decide what the parents' genotype and phenotype will be for each of the starred traits in table #1. Write each of the six traits in the table below. Determine the genotype for mom first! Flip a coin. Heads represents a dominant allele and tails represents a recessive allele. Flip a coin a second time to get the second allele.

For example, if I flipped heads first and then a tails mom's genotype would be Ee for eye color. If I flipped heads twice, then her genotype would be EE for eye color.

Repeat the same process for each of mom's traits and then for each of dad's. Use table #2-4 to help you determine the phenotype.

TABLE #5:

	Mom		Dad	
Trait	Genotype	Phenotype	Genotype	Phenotype
1.				
2.				
3.				
4.				
5.				
6.				



Heads = Dominant



Tails = Recessive

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PART 5 (PUNNETT SQUARES)

Directions: Using the information from table #5, complete a Punnett square for each of the six traits. This will help determine what traits could be passed down in your alien families!

Trait #1: _____

Trait #2: _____

Trait #3: _____

Trait #4: _____

Trait #5: _____

Trait #6: _____

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PART 6 (PERCENT & RATIO)

Directions: Copy two of the Punnett squares from part 5 into the Punnett squares below. Let's find the probability (ratio and percentages) of the babies having certain traits.

Problem 1: Punnett Square for _____ trait.

Possible Genotypes	Ratio	Percent	Possible Phenotypes	Ratio	Percent

Problem 1: Punnett Square for _____ trait:

Possible Genotypes	Ratio	Percent	Possible Phenotypes	Ratio	Percent

ALIEN FAMILY GENETICS PROJECT PART 7 (THE OFFSPRING)

Directions: Mom and Dad alien have had babies! For each trait you will roll a dice twice, once for child #1 and once for child #2. The number on the dice will determine the genotype for each child.

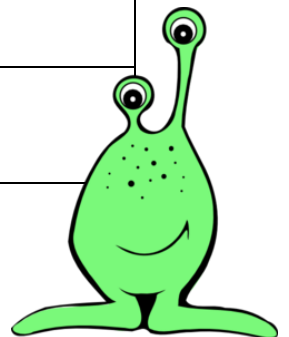
1	2
3	4

Look at the Punnett squares from part 5 of your project. Roll a dice and write the genotype from the corresponding square into table # 6.

For example, I roll a dice and get a two. I would then write the genotype that was in box #2 as the genotype for baby #1. Repeat this process for each child. If you roll a 5 or 6, roll again! Don't forget to name your alien children 😊

TABLE #6:

	Child #1 Name: _____		Child #2 Name: _____	
Trait	Genotype	Phenotype	Genotype	Phenotype
1.				
2.				
3.				
4.				
5.				
6.				



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PART 8 (FINDING A SPOUSE)



Directions: Love is in the air! Your alien child has found a spouse. Look at table #6, and copy all of the information for child #1 into table #7 below. Pair up with another group, write down the name of their child #1 as the name for spouse in the table below.

Without looking at their table, ask if their alien is heterozygous (Aa), homozygous recessive (aa), or homozygous dominant (AA) for trait number one. Give that same genotype for spouse in table #7. Repeat for all six traits.

TABLE #7:

	Child #1 Name: _____		Spouse Name: _____	
Trait	Genotype	Phenotype	Genotype	Phenotype
1.				
2.				
3.				
4.				
5.				
6.				

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PART 9 (PUNNETT SQUARES 2)

Directions: Using the information from table #7, complete a Punnett square for each of the six traits. This will help determine what traits could be passed down in your alien families!

Trait #1: _____

Trait #2: _____

Trait #3: _____

Trait #4: _____

Trait #5: _____

Trait #6: _____

ALIEN FAMILY GENETICS PROJECT PART 10 (THE GRANDBABIES)

Directions: Child #1 and their spouse have now had three babies! For each trait you will roll a dice three times, once for each grandchild. The number on the dice will determine the genotype for each child.

1	2
3	4

Look at the Punnett squares from part 9 of your project. Roll a dice and write the genotype from the corresponding square into table # 8.

For example, I roll a dice and get a two. I would then write the genotype that was in box #2 as the genotype for grandchild #1. Repeat this process for each child. If you roll a 5 or 6, roll again! Don't forget to name your alien grandchildren 😊

TABLE #8:

	Grandchild #1 Name: _____		Grandchild #2 Name: _____		Grandchild #3 Name: _____	
Trait	Genotype	Phenotype	Genotype	Phenotype	Genotype	Phenotype
1.						
2.						
3.						
4.						
5.						
6.						

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PART 11 (PEDIGREE)

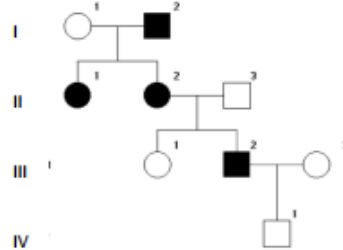
Directions: Create your alien family pedigree following the eye color trait. Darkened circles and squares should represent individuals with colorful eyes.

Include:

- A legend
- First names for all members
- A title detailing what trait you are illustrating
- Indicate people with the trait, carriers, and people without the trait

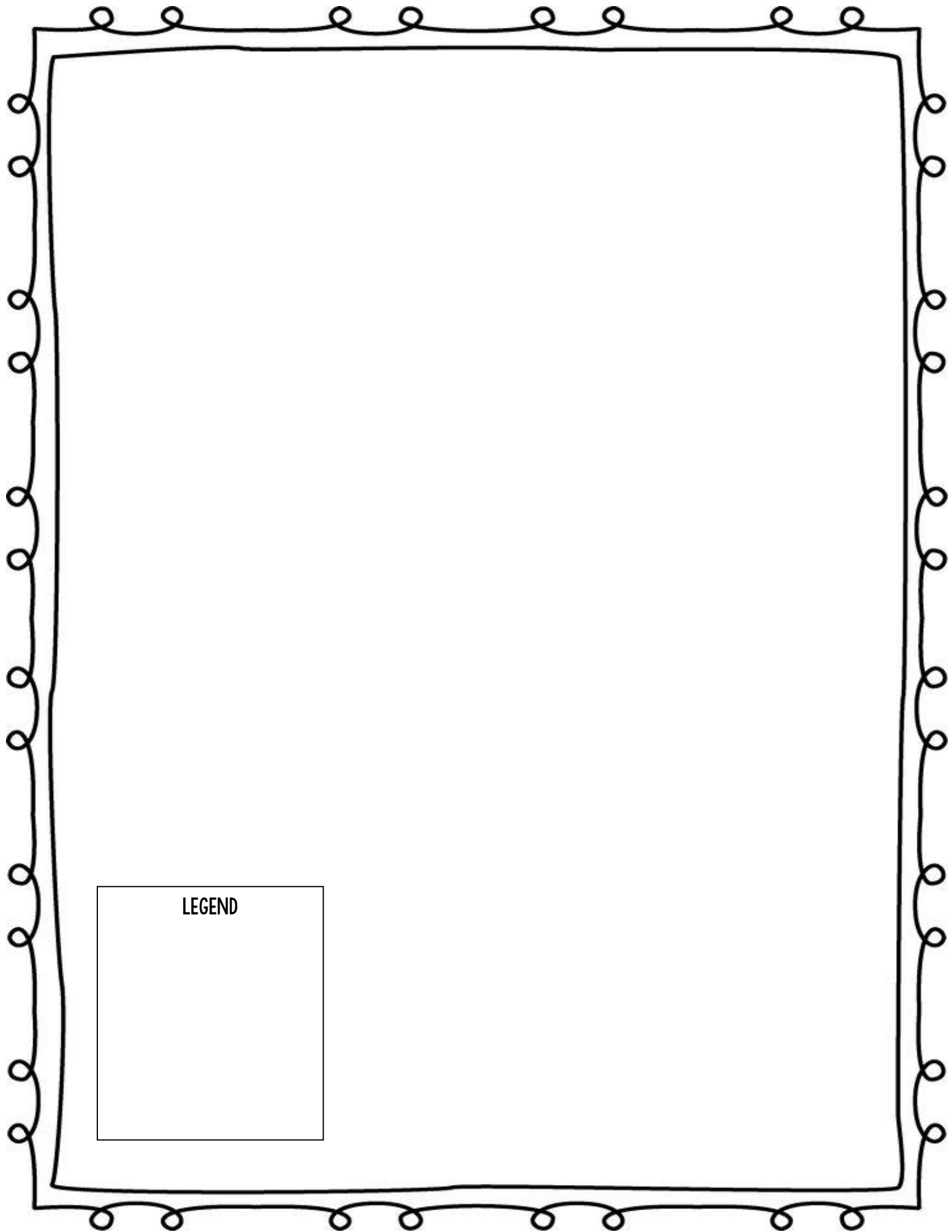
A pedigree chart displays a family tree, and shows the members of the family who are affected by a genetic trait. This chart shows four generations of a family with four individuals who are affected by a form of colorblindness.

- Circles represent females and squares represent males.
- Each individual is represented by:
 - a Roman Numeral, which stands for the generation in the family,
 - a Digit, which stands for the individual within the generation.
 (For instance, The female at the upper left is individual I-1.)
- A darkened circle or square represents an individual affected by the trait.



- The “founding parents” in this family are the female I-1 and the male I-2 in the first generation at the top.

- A male and female directly connected by a horizontal line have mated and have children. These three pairs have mated in this tree: I-1 & I-2, II-2 & II-3, III-2 & III-3
- Vertical lines connect parents to their children. For instance the females, II-1 and II-2 are daughters of I-1 and II-2
- The “founding family” consists of the two founding parents and their children, II-1 and II-2.



LEGEND

Alien Family Portrait

Directions: Draw two members of your alien family from different generations. Be detailed and make sure that all of the traits are illustrated. Picture must be in color.