

Alien Genetics for High Schoolers Worksheet

- Coin flip to determine own features (Heads = Dominant; Tails = Recessive) *Include PTC tasting
 - a.) Hand out "Parent" sheet.
 - b.) Flip a coin for each trait to determine genotype.
- Pair up and complete a Punnett Square for each of the features using info from both partners
 - a.) Use all 4/16 alleles (2/8 from each "Parent") to fill in the Punnett Square.
 - b.) To determine both your baby's sex and wing-type, use the Punnett Square you created for #6.
- Use a spinner (manual or Google) to determine the genotype and phenotype for the genes of your offspring.
 - a.) The numbers on the spinner correspond to an individual square on the Punnett Square
 - i.) The numbers start in the top left and go left -> right, top -> bottom

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

1	2
3	4



YOUR TRAITS (STEP 1)

Create your offspring using the materials provided:

#	Heads = Dominant; Tails = Recessive	Genotype	Phenotype
1	**Sex (Assign 1 partner XX (Female) and 1 partner XY (Male)) (you will not create a Punnett Square for this item)		
2	Eyes (Both eyes same color (MM, Mm) or each eye a different color (heterochromia) (mm)); you choose your eye color(s) and write under Phenotype		
3	Ears (Wiggle (W) or No Wiggle (w))		
4	Body Hair (Hairy (H) or Bald (h))		
5	Height (Digenic, 4 alleles (J, j, Z, z) Short (Dominant), Tall (Recessive), Medium (Hybrid)); you can choose to use your real-life height to create your genotype or flip a coin 4 times)		
6	Wings (Sex-linked to X chromosome (Feathery (F) or No feathers (f)); If your sex genotype is XY, you will only flip the coin 1x. If XX, flip the coin 2x)		
7	Fire (Non-Mendelian incomplete dominance, Blue (B) (Dominant), Red (b) (Recessive), purple (Hybrid))		
8	Teeth (Retractable (R) or Fixed (r))		
9	**Diet (Non-Mendelian codominance (Carnivore (C), Herbivore (H), or Omnivore (CH)); both parents will be Omnivores	CH	Omnivore
10	Special Trait (codominant trait; choose your own special trait and a letter to represent the alleles; try to choose a letter that has not been used)		

**Complete these items together with your partner.



OFFSPRING TRAITS (STEP 3)

#	Characteristic	Genotype	Phenotype
1	**Sex (complete with item 6, see below)		
2	Eyes		
3	Ears		
4	Body Hair		
5	Height (polygenic, 3 options)		
6	**Wings (sex-linked) (complete with item 1)		
7	Fire (incomplete dominance, 3 options)		
8	Teeth		
9	Carnivore (codominance, 3 options)		
10	Special Trait		

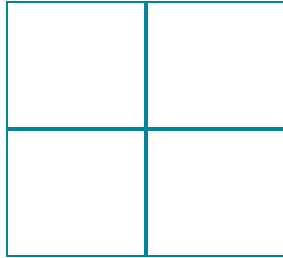
****Do items 1 and 6 together. Using the Punnett square you created for #6, use the spinner to determine the sex of your offspring and their wing-type.**



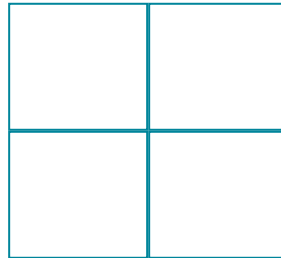
PARTNER PUNNET SQUARES (STEP 2)



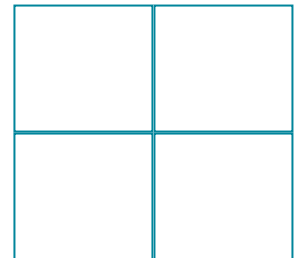
1 (see #6)



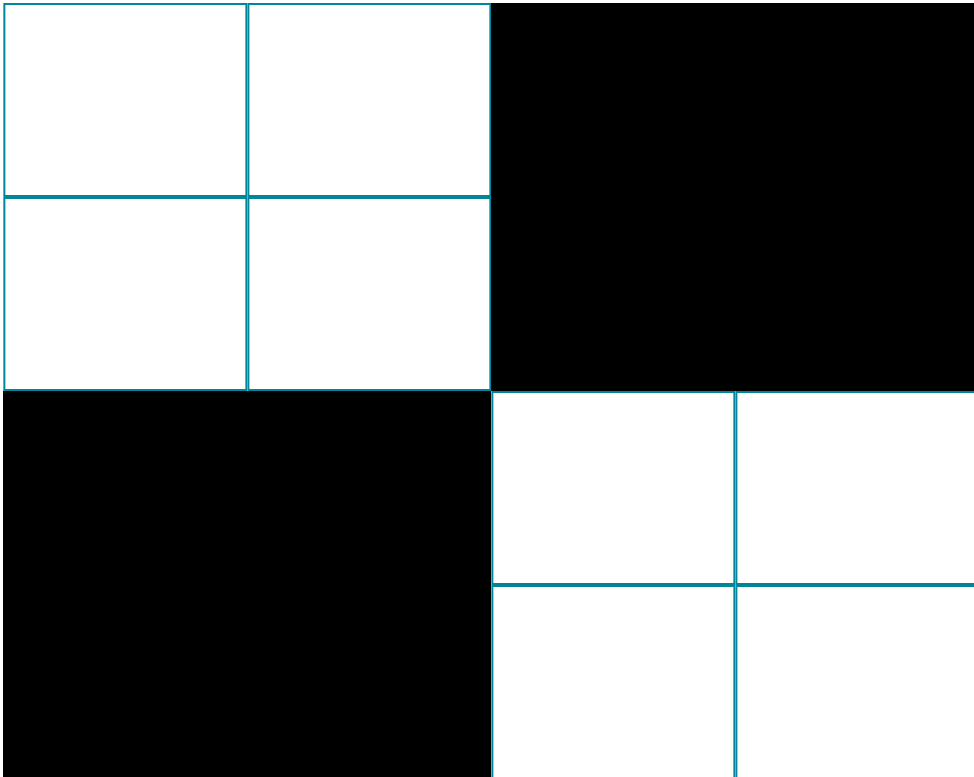
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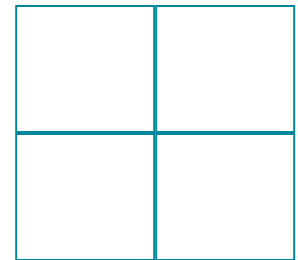
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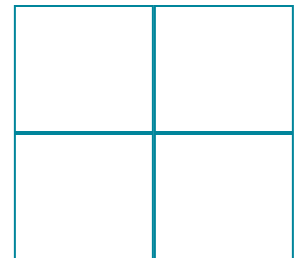
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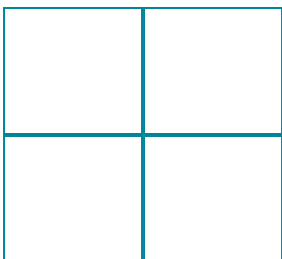
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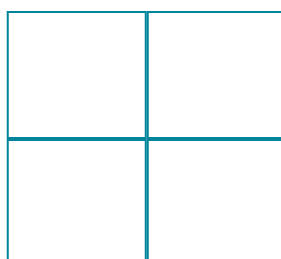
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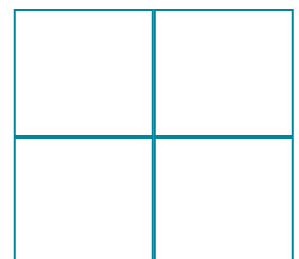
7



8



9



10



OPTIONAL CALCULATIONS

The Hardy - Weinberg Equation is a mathematical equation that can be used to calculate the genetic variation of a population at equilibrium. The equation is an expression of the principle known as Hardy-Weinberg equilibrium, which states that the amount of genetic variation in a population will remain constant from one generation to the next in the absence of disturbing factors. The Hardy-Weinberg equation is expressed as: $p^2 + 2pq + q^2 = 1$, where p is the frequency of the "A" allele and q is the frequency of the "a" allele in the population. In the equation, p^2 represents the frequency of the homozygous genotype AA, q^2 represents the frequency of the homozygous genotype aa, and $2pq$ represents the frequency of the heterozygous genotype Aa. In addition, the sum of the allele frequencies for all the alleles at the locus must be 1, so $p + q = 1$. If the p and q allele frequencies are known, then the frequencies of the three genotypes may be calculated using the Hardy-Weinberg equation. In population genetics studies, the Hardy-Weinberg equation can be used to measure whether the observed genotype frequencies in a population differ from the frequencies predicted by the equation.

Directions: Use items 2, 3 and 7 from the "YOUR TRAITS" chart to do your own Hardy -Weinberg calculations. Your teacher will lead you through these as a class.

Workspace: