Baby Lab

Name_____

GOALS:

I can use Punnett squares to model meiosis and inheritance of Mendelian traits (dominant/recessive).
I can determine the genotype and phenotype of a child based on a Punnett square.
I can apply correct vocabulary to different genotypes.

BACKGROUND:

Asexual and sexual reproduction both have distinct advantages and disadvantages, when it comes to evolution. However, sexual reproduction creates more diverse phenotypes and can add variety to a population. This variety is the result of your DNA recombining it during during meiosis, and then sorting it into cells that have only 1 copy of each gene. This can result in 4 eggs or sperm that are all genetically different from one another.

Most traits are simply dominant or recessive. Dominant traits are expressed, but recessive ones do not appear in the phenotype. However, many other traits don't follow this pattern. Some traits are **Polygenic**, meaning that multiple genes control the trait. Some genes follow **Incomplete Dominance**, where the dominant trait doesn't completely cover up the recessive trait, causing a mixing of the traits (think red+white=pink). Finally, there are some traits that are **Codominant**. This means that both traits are equally expressed (think red+white= red and white stripes).

PRE-LAB:

Determine your own genotype based on the trait keys given in the final pages of the packet. If you have a dominant trait, you might know your phenotype if one of your parents has the recessive phenotype and you have the dominant one. If you can't figure out your parents' genotypes, you could be either homozygous dominant for the trait, or you could be heterozygous. For the sake of this lab, flip a coin when determining your genotype for those traits. If it lands heads-up, you are homozygous dominant. If it is tails-up, you will be heterozygous. (REMINDER: some of the letters may be used twice, so be sure you know which trait you're referring to.)

LAB PROCEDURES:

1. Find a partner to do the lab with. You and your partner will be having a baby!
2. Determine your child's sex. Sex chromosomes in women are X and X, while sex chromosomes in men are X and Y. Perform a cross. What are the chances that a boy will be born? What are the chances that a girl will be born? Flip a coin to determine the sex. (Heads= girl, tails=boy).
3. For other genes, perform a Punnett square to show the odds of having a child with a given genotype. To determine which box your child will have, flip a coin for each of you. If it lands heads, you use your first allele, and tails will be using your second allele. Write the probabilities of having each genotype and phenotype, and circle your child's genotype in the cross.
   ex.) I am Qq for a trait, and my partner is QQ. We both flip tails, so I give the kid a "q", and my partner gives the kid their second "Q".

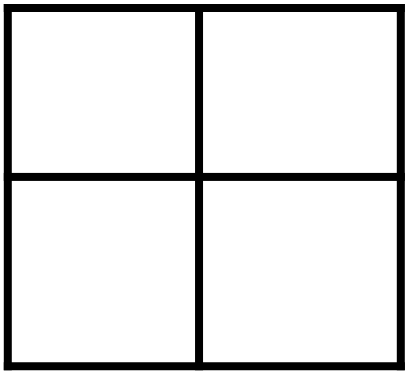
	Q	**q**
Q	QQ	Qq
Q	QQ	**Qq**

<—This is the genotype our kid ends up with

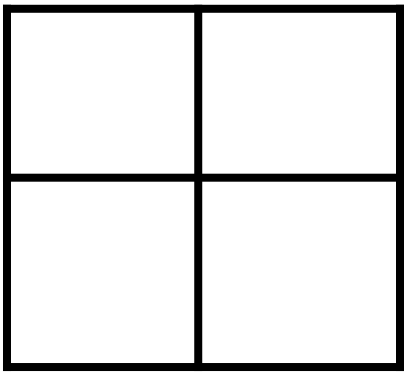
4. Use the directions for polygenic traits (dihybrid cross) to determine your child's eye and hair color.
5. On the final trait (skin color), your child will have a mixture of your skin tones.
6. Fill in your child's genotype and phenotype. Draw a picture of your child in the space provided.

Trait	Your phenotype	Your genotype	Partner Phenotype	Partner Genotype
Hair Color				
Eye Color				
Shape of Face				
Cleft in Chin				
Hair				
Widow's Peak				
Spacing of Eyes				
Shape of Eyes				
Position of Eyes				
Size of Eyes				
Length of Eyelashes				
Shape of Eyebrows				
Position of Eyebrows				
Size of Nose				
Shape of Lips				
Size of Mouth				
Size of Ears				
Freckles				
Dimples				
Skin Color		xxxxxxxxxxx		xxxxxxxxxxx

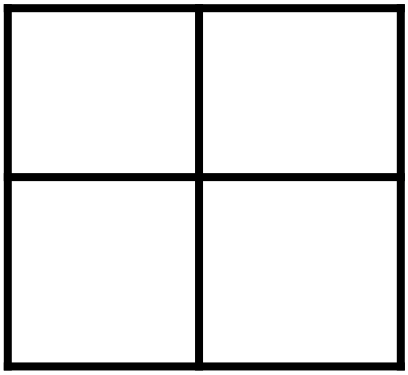
Shape of face



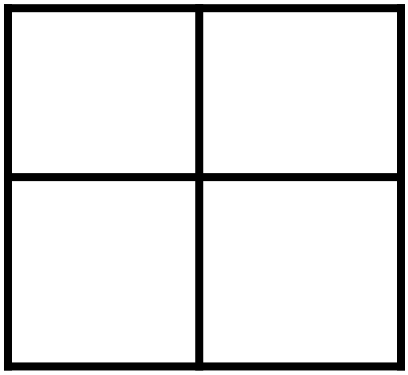
Cleft in Chin



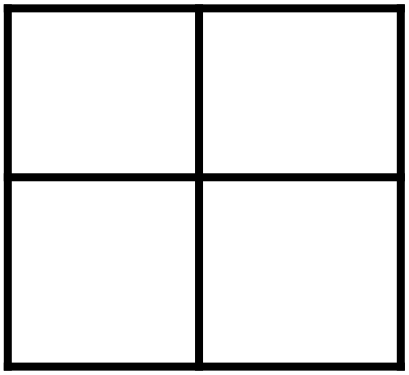
Hair



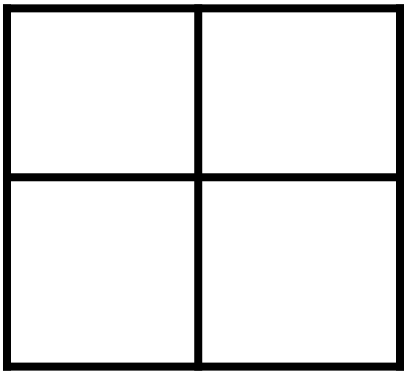
Widow's Peak



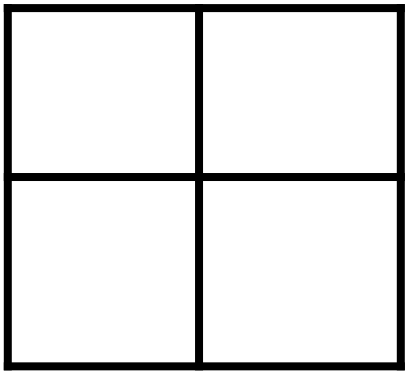
Spacing of Eyes



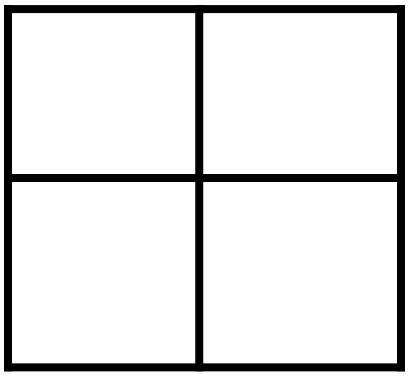
Shape of Eyes



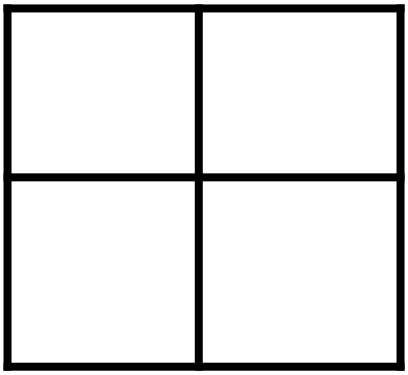
Position of Eyes



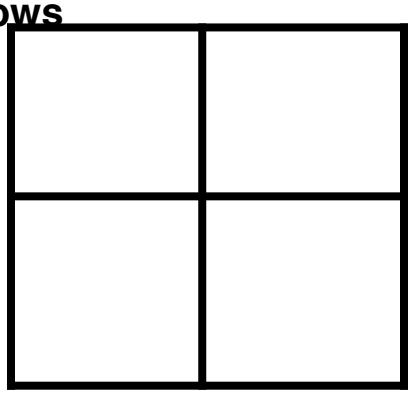
Size of Eyes



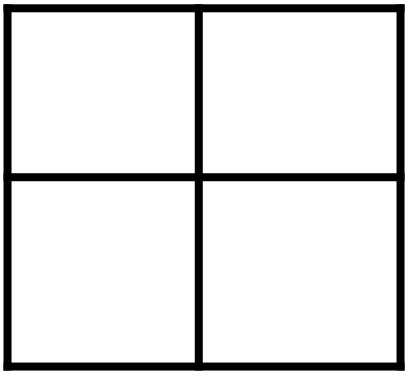
Length of Eyelashes



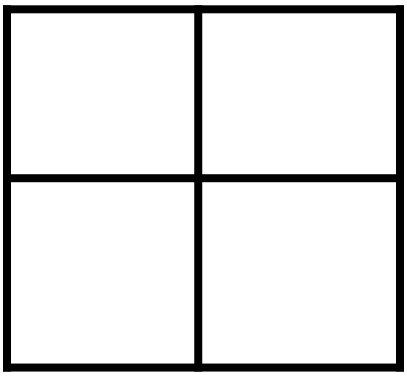
Shape of Eyebrows



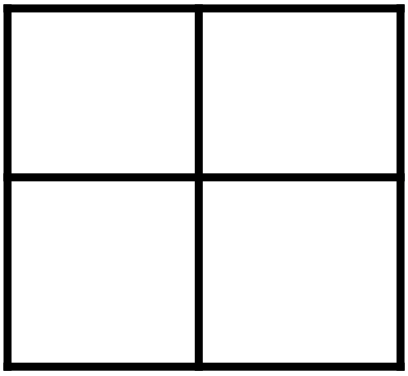
Position of Eyebrows



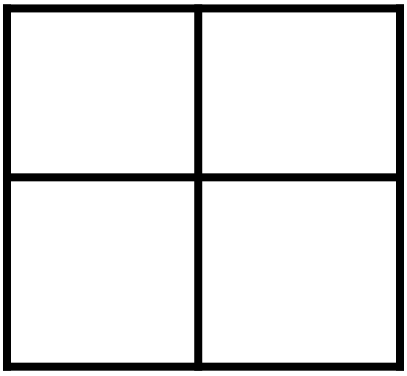
Size of Nose



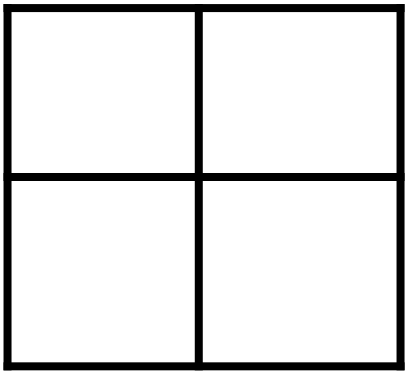
Shape of Lips



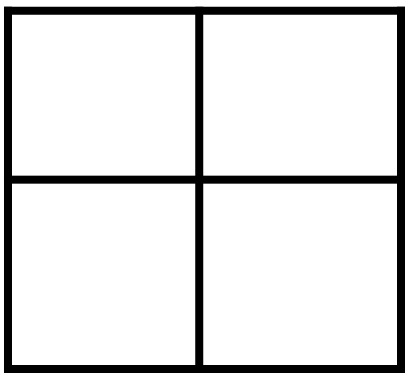
Size of Mouth



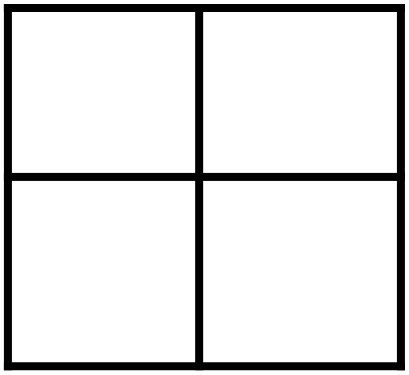
Size of Ears



Freckles



Dimples

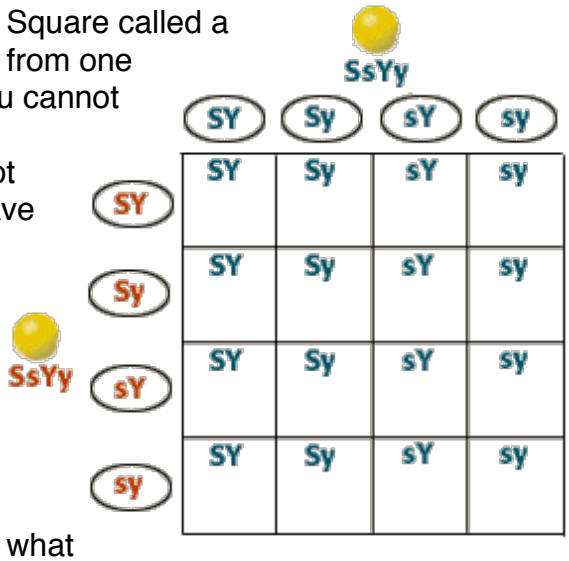


DIHYBRID CROSSES: TWO TRAITS AT ONCE

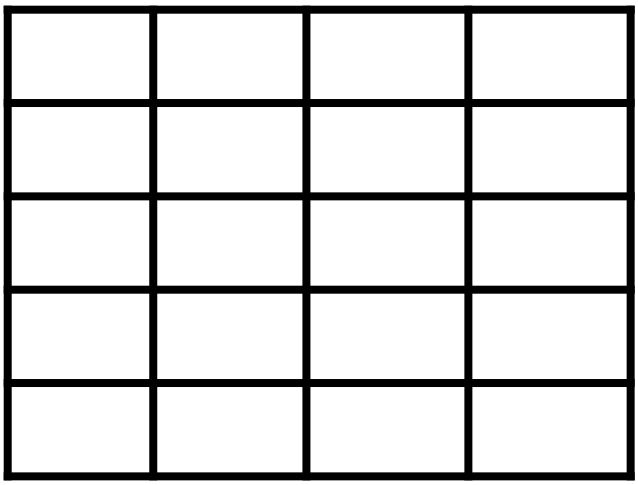
For traits that are polygenic, we must use a special Punnett Square called a dihybrid cross. During meiosis, alleles for the same gene separate from one another. This is called the Law of Segregation. This means that you cannot have two alleles for the same gene in the same cell at the end of meiosis. For example, if a person has the alleles AaBb, they cannot make cells that have Aa or Bb in meiosis (because these would have 2 alleles for the same gene in them).

In addition, separate alleles for separate traits are also passed independently of each other (Law of independent assortment). This means you can have **any combination of alleles for different traits possible** at the end of meiosis. So, if a person has AaBb, they can make the following cells through meiosis: AB, Ab, aB, and ab.

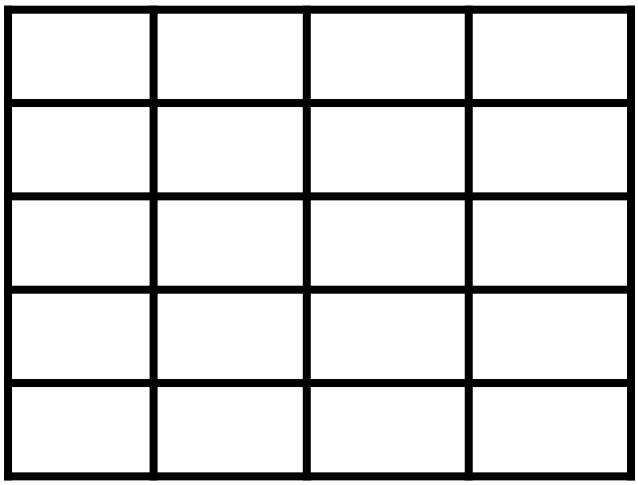
Use your alleles and your partner's alleles to determine the possible cells made by meiosis, and then perform the cross to see what possible genotypes your child could have. Toss a coin up, and whichever box it lands in, your child will have that genotype.



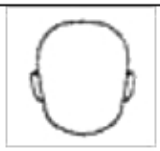
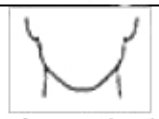
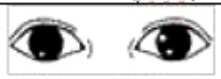
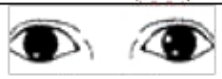
Hair Color



Eye Color

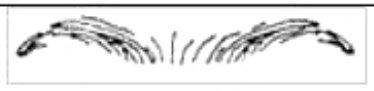
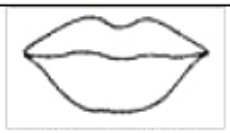
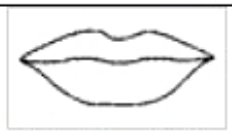
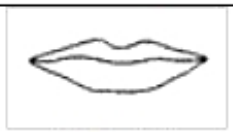
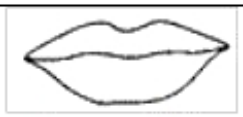
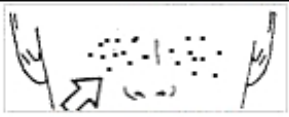
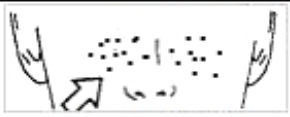


Human Variations

Trait	Dominant (both heads)	Hybrid (one head, one tail)	Recessive (both tails)
Shape of Face	 Round (RR)	 Round (Rr)	 Square (rr)
Cleft in Chin	 Absent (CC)	 Absent (Cc)	 Present (cc)
Hair	 Curly (HH)	 Wavy (Hh)	 Straight (hh)
Widow's Peak	 Present (WW)	 Present (Ww)	 Absent (ww)
Spacing of Eyes	 Close (EE)	 Normal (Ee)	 Far (ee)
Shape of Eyes	 Almond (AA)	 Almond (AA)	 Round (aa)
Position of Eyes	 Straight (SS)	 Straight (Ss)	 Slant (ss)
Size of eyes	 Large (LL)	 Medium (Ll)	 Small (ll)

If the genotype is....	The Eye color is....
AABB	dark brown
AABb	dark brown
AAbb	brown
AaBB	brown with green flecks
Aabb	brown
AaBb	gray
aaBB	green
aaBb	dark blue
aabb	light blue

If the genotype is....	The hair color is....
AABB	black
AABb	black
AAbb	red
AaBB	brown
Aabb	regular blonde
AaBb	brown
aaBB	dark blonde
aaBb	regular blonde
aabb	pale yellow blond

Trait	Dominant (both heads)	Hybrid (one head, one tail)	Recessive (both tails)
Length of Eyelashes	 Long (LL)	 Long (Ll)	 Short (ll)
Shape of Eyebrows	 Bushy (BB)	 Bushy (Bb)	 Thin (bb)
Position of Eyebrows	 Not connected (NN)	 Not connected (Nn)	 Connected (nn)
Size of Nose	 Large (NN)	 Medium (Nn)	 Small (nn)
Shape of Lips	 Thick (TT)	 Medium (Tt)	 Thin (tt)
Size of Mouth	 Large (LL)	 Medium (Ll)	 Small (ll)
Size of Ears	 Large (LL)	 Medium (Ll)	 Small (ll)
Freckles	 Present (FF)	 Present (Ff)	 Absent (ff)
Dimples	 Present (DD)	 Present (Dd)	 Absent (dd)

Trait	Baby's Genotype	Baby's Phenotype
Hair Color		
Eye Color		
Shape of Face		
Cleft in Chin		
Hair		
Widow's Peak		
Spacing of Eyes		
Shape of Eyes		
Position of Eyes		
Size of Eyes		
Length of Eyelashes		
Shape of Eyebrows		
Position of Eyebrows		
Size of Nose		
Shape of Lips		
Size of Mouth		
Size of Ears		
Freckles		
Dimples		
Skin Color	xxxxxxxxxxxxxxxx	

BABY____

(name)

REVIEW QUESTIONS:

1. Most traits follow dominant-recessive patterns, but some do not. Which trait(s) were codominant and which trait(s) were incomplete dominance? What traits were polygenic?

2. During meiosis, the two alleles you have for a gene segregate, allowing an offspring to receive only one per parent. Explain how a Punnett square shows this.

3. Many people think that a dominant phenotype is the most common. Is the dominant trait always most common? Give one example where the dominant phenotype is not the most common, and explain how the recessive phenotype can be more common in some cases.

4. In the past two years, technology has allowed for “designer babies”, where a couple can actually determine which of their alleles a child receives for certain genes. Some couples are upset to find, however, that their child may not be able to have whichever hair color, eye color, hair curliness, ect. that they desire. Why might a couple’s child not be able to have some of these traits that they desire?

5. Pretend that a couple were both hybrids for Eyebrow Position. What are the chances that their child could have connected eyebrows? Perform a Punnett Cross and write the results.