DO NOT WRITE ON THIS SHEET

Name _____ Class _____ Date _____

Laboratory Investigation

Human Genetics **4**

Investigating the Results of Inherited Traits

Background Information

Heredity is the passing on of traits, or characteristics, from parent to offspring. The units of heredity are called genes. Genes are found on the chromosomes in the cell. The combinations of genes for each trait occurs by chance.

When one gene in a gene pair is stronger than the other gene, the trait of the second gene is masked, or hidden. The stronger gene is the dominant gene. The gene that is masked is the recessive gene. Dominant genes are written as capital letters and recessive genes are written as lowercase letters. If both genes in a gene pair are the same, the trait is said to be pure. If the genes are not similar, the trait is said to be hybrid. Sometimes genes can be neither dominant nor recessive. The result of such a situation is incomplete dominance. (codominance)

The genetic makeup of an individual is known as its genotype. The observable physical characteristics of an individual that are based on its genotype are known as its phenotype. In humans, the sex of an individual is determined by the male gene. Individuals who have two X chromosomes (XX) are females, whereas individuals with an X and a Y chromosome (XY) are males.

In this investigation you will observe how the results of different gene combinations produce certain traits.

Problem

How are traits inherited?

Materials *(per pair of students)*

3 textbooks
2 coins
pencil

Procedure

1. Place the three textbooks on the table to form a triangular well in which to toss the coins.
2. Determine which partner will toss for the female gene and which will toss for the male gene. Remember that there are two genes per trait.
3. Have the partner who is representing the male gene flip a coin into the well to determine the sex of the offspring. If the coin lands heads up, the offspring is a female. If the coin lands tails up, the offspring is a male. Record the sex of the offspring in Observations.
4. For all the coin tosses you will now make, heads will represent the dominant gene and tails will represent the recessive gene.
5. You and your partner should now flip your coins into the well at the same time. **Note:** *The coins should be flipped only once for each trait.*

6. Continue to flip the coins for each trait listed in the table. After each flip, record the trait of your offspring by placing a check in the appropriate box in the following table.

7. Using the recorded traits, draw the facial features for your offspring in the space provided in the Observations.

Traits	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 together (EE)	normal distance (Ee)	far apart (ee)
Shape of eyes	almond (AA)	almond (Aa)	round (aa)
Position of eyes	straight (SS)	straight (Ss)	slant upwards (ss)
Size of eyes	large (LL)	medium (Ll)	small (ll)

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Traits	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)	fine (bb)
Position of eyebrows	not connected (CC)	not connected (Cc)	connected (cc)
Size of nose	large (LL)	medium (Ll)	small (ll)
Shape of lips	thick (TT)	normal (Tt)	thin (tt)
Size of ears	large (LL)	normal (Ll)	small (ll)
Size of mouth	large (LL)	medium (Ll)	small (ll)
Freckles	present (FF)	present (Ff)	absent (ff)
Dimples	present (DD)	present (Dd)	absent (dd)

11. EYE COLOR: Darker eyes are produced in the presence of more active alleles. In this situation, the large letters (A or B) represent alleles which are active in depositing dark pigment. Small letters (a and b) represent alleles which deposit little pigment.

To determine the color of the eyes, assume there are two gene pairs involved, one which codes for depositing pigment in the front of the iris and one which codes for depositing pigment in the back of the iris. Determine the genotype of the first pair (AA, Aa, aa) and then the second pair (BB, Bb, bb). If your genotype is --1-- the eye color is --2--. In reality, the determination of eye color is much more complicated.

--1--	--2--	--1--	--2--
AABB	Dark brown	AAbb	Dark blue
AABb	Brown	aaBB	Dark blue
AaBB	Brown	Aabb	Light blue
AaBb	Brown	aabb	Pale blue
		aaBb	Blue

EYE TRAITS -- NEXT FOUR FLIPS Determine the phenotype with respect to all four flips before drawing the eyes.

12. Hair color - do the same as #11 eye color

AABB - black	AAbb - blonde
AABb - dark brown	aaBB - red
AaBB - med. brown	aaBb - gray
AaBb - light brown	Aabb - white
	aabb - bald

13. DARWIN'S EARPOINT: 12430

PRESENT (DD, Dd)

ABSENT (dd)

14. EAR PITS: 12870*

PRESENT (PP, Pp)

ABSENT (pp)

15. HAIRY EARS: 13950 (Hairy ears is sex-limited to males)

ABSENT (HH, Hh)

PRESENT (hh)

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Analysis and Conclusions

1. Would you expect the other pairs of students in your class to have an offspring similar to yours? Explain. _____

2. If a man who has long eyelashes (LL) marries a woman who has long eyelashes (Ll), what are the possible genotypes and phenotypes of their children?

3. What are the possible genotypes of the parents of a child who has wavy hair (Hh)?

4. Which traits in the investigation showed incomplete dominance?

Critical Thinking and Application

1. Can the actual traits of an offspring be determined by knowing the traits of the parents?

2. A woman received the genes aBcD from her mother and AbCd from her father. Which of the following gene combinations could be present in her sex cells: ABCD, abcd, ABCDD, aBccD, ABcd, AaBb. _____

bservations

ex of offspring _____

Data:

Male or Female: _____

Trait	Genotype	Phenotype
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 ears		
Size of mouth		
Freckles		
Dimples		
Eye color		
Hair color		
Darwin's earpoint		
Ear pits		
Hairy ears (only possible if male)		