

"Beaker Babies"

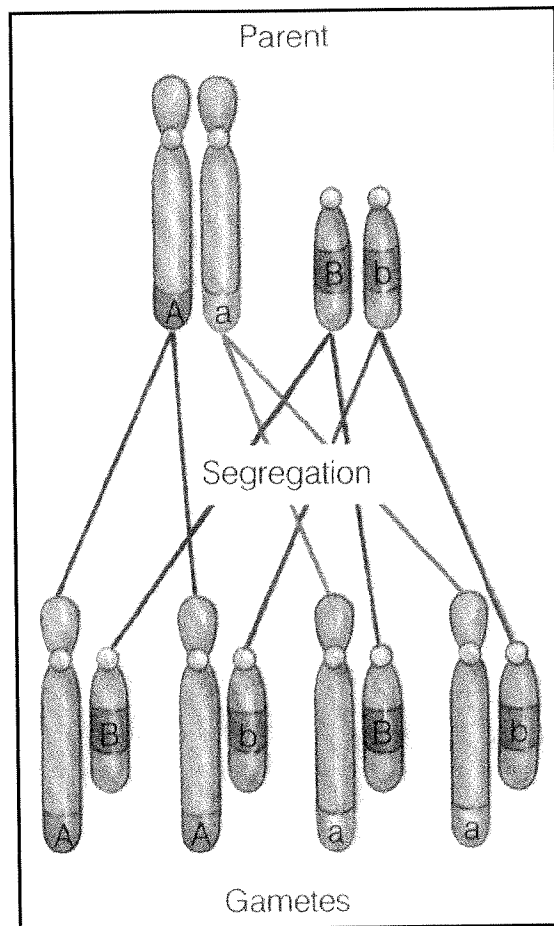
BACKGROUND:

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 a cell. The combinations of genes for each trait occur by chance.

When one gene in a pair is stronger than the other gene, the trait of the weaker gene is masked, or hidden. The stronger gene is the *dominant* gene, and 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 *homozygous*, or *pure*. If the genes are not similar, the trait is said to be *heterozygous*, or *hybrid*. Sometimes genes are neither dominant nor recessive. The result of such a situation is a blending of traits.

The genetic makeup of an individual is known as its *genotype*. The observable physical characteristics of an individual that are the result of its genotype are known as its *phenotype*. In humans, the sex of an individual is determined by the particular combination of the two *sex chromosomes*. Individuals that have two *X* chromosomes (*XX*) are females, whereas those with an *X* and a *Y* chromosome (*XY*) are males.

In this activity, you will observe how the results of different gene combinations produced certain traits and investigate the process of *independent assortment* in gamete formation.



MATERIALS:

- Data Table containing genotype and phenotype information
- "Beaker Babies" Activity Sheet
- Photocopies of male and female gametes
- Two containers
- coin

PROCEDURE:

Part A: Determining Your Dominant and Recessive Traits (your genotype)

1. Determine the genotype (code) for your features using *Table #1* on the following page. Complete the last column of the chart by choosing the letter that fits your description. Use only ONE letter for each characteristic (i.e. *B* or *b*, not *BB* or *bb*)

TABLE #1: YOUR GENOTYPE

CHARACTERISTIC	DOMINANT TRAIT		RECESSIVE TRAIT		YOUR CODE
1. Hair color	Brown/black	B	Blonde/red	b	
2. Hair texture	average	T	Thick/thin	t	
3. Hair wave	yes	W	no	w	
4. Length of eyelashes	long	M	short	m	
5. Widow's peak	yes	P	no	p	
6. Face shape	oval	O	other	o	
7. Skin coloration	Black/average	S	Fair/reddish	s	
8. Skin freckles	yes	F	no	f	
9. dimples	yes	D	no	d	
10. Eye color	brown	H	Blue/green	h	
11. Ear size	average	A	Large/small	a	
12. Eye shape	round	U	other	u	
13. eyebrow	two	E	one	e	
14. Ear length	long	I	Short	i	
15. Attached ear lobe	yes	Q	No	q	
16. Nose size	average	N	Small/large	n	
17. Nose shape	straight	V	other	v	
18. Lip shape	full	L	thin	l	
19. Tongue curl	yes	K	no	k	
20. Tongue roll	yes	R	no	r	
21. Chin size	average	C	Small/large	c	
22. Chin cleft	yes	G	no	g	

Homework Check-sheet

CHARACTERISTIC	FATHER	MOTHER
1. Hair color		
2. Hair texture		
3. Hair wave		
4. Length of eyelashes		
5. Widow's peak		
6. Face shape		
7. Skin coloration		
8. Skin freckles		
9. dimples		
10. Eye color		
11. Ear size		
12. Eye shape		
13. eyebrow		
14. Ear length		
15. Attached ear lobe		
16. Nose size		
17. Nose shape		
18. Lip shape		
19. Tongue curl		
20. Tongue roll		
21. Chin size		
22. Chin cleft		

Directions: Observe your parents and complete the above chart before proceeding with the remaining sections of this activity.

2. Complete **YOUR GENOTYPE** by comparing your dominant and recessive traits with your parent's traits. Using the homework check-sheet (*previous page*), determine your 2nd letter using the following rules:

- a) FIRST— write your **known** code from Part A, procedure 1 in the left-hand column in Table below.
- b) Since recessive traits are homozygous, write a small letter beside all your little letters.
(example: b b)
- c) If the first letter is a CAPITAL, compare your traits with those of your parents. If:
(1) both parents show the same trait as you, add a CAPITAL letter beside your first letter.
(example: C C)
(2) One or both of your parents don't have the same trait as you, add a small letter beside your capital letter. (example: C c)
- d) In space #23 put X X if you are a girl and Y X if you are a boy.

Part B: Forming an Egg or Sperm (Meiosis)

1. Your genetic code (genotype) has two letters for each trait. You may only pass on **ONE** of the two letters.
(example: b, F, d, etc.) The baby may inherit the first or second letter based on the following rules:
 - a) Many genetic traits are inherited independently based on random chance (50 / 50).
 - b) Some traits are linked or connected. Connected traits must be inherited together in sets.
2. Prepare a slip of paper to represent your egg or sperm. (find it on teacher's desk) Make sure to put your name on it.
3. To determine whether the baby will inherit the first letter of your code or the second letter, flip a coin. If the choice is heads list the letter in the first column on the slip. If the coin is tails, list the letter in the second column on the slip.
4. Traits 11 and 14 are connected and 16 and 17 are connected.
5. Flip the coin for each trait until your slip has 23 letters on it. Fold up the slip and place it in the appropriated container in the front of the room.

YOUR GENOTYPE

KNOWN LETTER From Part A	SECOND LETTER	YOUR GENOTYPE
1.		
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2. Repeat procedures 1 through 5 again and record the new egg or sperm in the second column of Table #2 ("YOUR CODE")

TABLE #2

*Part C: Forming the Zygote
(fertilization)*

1. To determine the genotype of your offspring, draw a slip at random from the container for the opposite sex.
2. Copy the letters listed on the slip in the third column of *TABLE #2* ("SLIP'S CODE")
3. Congratulations! The zygote is formed. A combination of your code + the slip's code (*other gamete*) will produce the baby's code (*the zygote*) To describe your baby, compare your baby's code to the traits listed on the chart in Part A. Then, complete the Birth Certificate. (the *phenotype*)

BABY'S CODE (diploid)	YOUR CODE (haploid)	SLIP'S CODE (haploid)
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Birth Certificate

(circle or fill in the appropriate information)

This is to announce the birth of _____ a delightful little (boy/girl). The proud parents are _____ and _____. The baby has a _____ shaped face. Naturally, (he/she) (can/cannot) roll (his/her) tongue. This (brown/green/blue eyed), _____ haired baby (girl/boy) has a very nice _____ colored skin. (With/without) (his/her) widow's peak, _____ shaped eyes, _____ in color, under (one/two) eyebrow(s), there is not doubt that this cute, little bundle o'joy is bound for fame and fortune. When the baby smiles, (he/she) (will/will not) show dimples. (He/she) also has two (long/short), (small/average/large) ears (with/without) a chin cleft. As the baby plays, (he/she) (is/is not) able to curl (his/her) tongue. To be sure, (he/she) resembles _____ more than _____.

QUESTIONS AND CONCLUSIONS:

1. Is it possible to create a face identical to yours? _____

Would you expect this to occur in class? Explain. _____

2. What is the probability of producing a male? _____

A female? _____

3. Why are traits 11 and 14 inherited together? _____

4. Is it possible for you to show a trait when neither of your parents show it? _____
Why? _____

5. Can your genetic traits be similar to your grandparents? _____
Why? _____

6. Do you think that anyone else in this class has the same genetic traits that you have? _____
Why or why not? _____

7. There have been cases in history where a king divorced his queen because she produced only daughters. Using your knowledge of genetics, explain why this was an incorrect move. _____

8. In this activity we were dealing with 22 different genetic traits. How many genes make up the genetic profile for humans? _____
9. What is it called when more than one gene is responsible for a single trait? _____

10. What is incomplete dominance? _____

Name _____

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