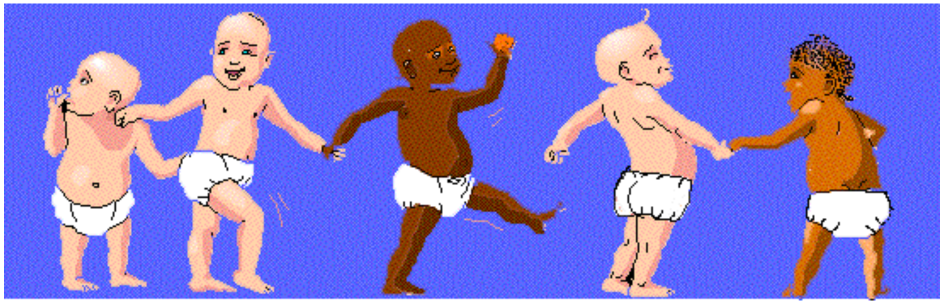
Name:____ Date:_________________ Period:___________

Let's Make a Face: A Genetic Simulation

Converting Genotype Into Phenotype by Simulating Meiosis and Fertilization



After this simulation, you should be able to answer the following questions:

- How many chromosome pairs does each human parent have?
- How many chromosomes does each parent "donate" to the next generation?
- Are some genes and gene characteristics expressed over others.... are dominant and recessive genes responsible for how a baby looks?
- What is the difference between Genotype and Phenotype?
- Do some traits require more than one gene to be fully expressed?
- What are sex-linked traits?
- How is there so much variation in the way children look even if they come from the same parents?
- What are polygenic traits?
- How does the environment affect the expression of genes?

You have been given a pink set of chromosomes if you are going to represent the mother, and a blue set of chromosomes if you are going to represent the father. We are asking the question... What would your baby look like if both you and your classmate (who will simulate the other parent) have one dominant gene and one recessive gene for each of the facial features illustrated on the following pages?

Instructions

1. Making the Chromosome Models

Follow the instructions to make the cut-out, folded chromosome models. Note that the two sides of each "chromosome" are different – each side carries a different version (allele) of each gene for this simulation.

2. Meiosis: Creating the Germ Cells

Hold your set of chromosomes high in the air above your head. Drop them one at a time to the floor. If they don't twirl then drop them again. When they have all dropped to the floor carefully pick them up without turning them over and find a lab table where you can face each other, then organize them according to size. Your teacher will demonstrate how they should line up. Equal sizes should be across from each other as you face your partner. The sex chromosomes should be organized separately from the 22 other (autosomal) chromosomes. Keep in mind that you begin this exercise with the chromosome pair above your head, dropping them so that they twirl down to the floor and finally land. Only **one** of each chromosomal pair faces up. The upward facing one of the pair represents the chromosome that ended up in the successful germ cell that you have just produced. Yes, those 23 chromosomes that are all neatly lined up represent the contents of your sperm or egg.

3. Fertilization

Gently push the like-sized chromosomes toward each other at point halfway between you, pairing them up according to size and number. This represents the moment when a new human potential is reached. A totally unique human is conceived!

4. Determination of Characteristics

Determination of child's sex. After conception, parents are always interested in determining the sex of their child. In this case the "father" has pushed either an "X" chromosome or a "Y" chromosome toward the middle (which ever dropped facing up) and matched it with the "mother's" "X" chromosome. If an "X", then you have a beautiful little girl, if a "Y", then a beautiful little boy! Record the information on your data sheet.

Determination of various genotypes. Carefully read the genes on all of the chromosomes and circle the resulting genotypes and phenotypes on your data sheet. These are the genes that make up the new baby's genotype.

5. Envisioning the New Person

Time passes, you get older, your baby is growing up! What does your child look like when he or she is a teenager of about 15 years of age? Make a full page, color drawing of your teenager's face using your best drawing ability. Color is necessary; some of the genes produce pigment!

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7. Understanding the Process of Heredity

Answer the questions about the traits of "your" child on the question sheet. Use the descriptions of the genes and chromosomes to help you with your answers.

Let's Make A Face: Questions

1. Why did you cut out the chromosomes in pairs?

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2. When you folded the pair of chromosome and dropped them, what did that represent? ______________________________

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3. What is the significance of only one of the pair of chromosomes ending its random journey facing up? ____________________

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4. When you and your partner pushed the like pairs of chromosomes together, what was the number of chromosomes before and after you pushed them together?

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5. What is it called when two genes are in a cell and one gene's phenotype is expressed and one is not? Explain and give an example of when this happened. ______________________

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