Name: _____ Date: _____

Lab Partners:_____

Potato Head Genetics /95 total points

Introduction:

In the sexual life cycle organisms undergo **meiosis** to produce **haploid gametes** (sperm & egg) from **diploid body** cells. Gametes have half the number of chromosomes found in body cells since they do not have pairs of chromosomes. During meiosis **independent assortment** of chromosomes, **crossing-over,** and **segregation** shuffles genes, this shuffling of genes usually results in a different combination of alleles in the gametes created from a single body cell. The joining of haploid sperm and egg during **fertilization** restores the diploid number of chromosomes in the body cells of the offspring.

In this activity you will model the process of **meiosis** and **fertilization** using Mr. and Mrs. Potato Heads. Your group will work with seven pairs of chromosomes and seven traits in your Potato Heads. In the first part of the activity, body cells in your Mom and Dad Potato Heads will undergo meiosis producing haploid gametes. Following meiosis, you will then combine the chromosomes from each sperm and egg to determine the genotype (genetic result) and phenotype (physical appearance) of your baby Potato Head for each of the seven traits.

Material:

1 bag containing Mom (pink) & Dad's (blue) chromosomes 1 Lab
1 Mr./Mrs. Potato Head Silly Suitcase

Procedure: When possible answer in complete sentences.

1. Remove the pink and blue sets of chromosomes for the bag. Spread out each set, keeping the mom and dad chromosomes separate. In each set, arrange the chromosomes of the same length as **homologous pairs** with the letters *facing down*. You should have seven pairs of chromosomes in each set.

2. Line up the paired chromosomes in each set from the longest to shortest.

A. Does each set of chromosomes represent the chromosomes from a diploid or haploid cell? Explain how you know. (2 pts)

_____

_____

_____

B. These chromosomes represent chromosomes in the cells about to undergo meiosis to form gametes. In what parts of the male & female human body do these processes normally happen? (2 pts)

_____

3. Randomly select one chromosome from each of the homologous pairs of Mom's chromosomes and randomly select one chromosome from each pair of Dad's homologous chromosomes, for a total of 7 pink and 7 blue. Keep both the blue and pink chromosomes separate at this point. (Remember the letters need to be **face down**, because the process of independent assortment is random). Return the unselected chromosomes back into their bag;

A. What cell division process are you modeling in step 3? (1 pt) _____

B. What type of cell does this process produce? (1 pt) _____

6 Points

C. Why is it important that this process (meiosis) reduce the chromosome number? (2pts) _____

_____

_____

_____

4. Combine all the selected chromosomes from each parent and pair them together by length. You should have one chromosome of each color in each pair of homologous chromosomes for a total of 14.
A. What process are you modeling in step 4? (1pt) _____

5. Turn the chromosomes over to reveal the letters representing alleles. Record the alleles from each parent in the appropriate column in Table 1 "Our Baby" and also give you baby a name. (15pts)

6. Determine the genotype and phenotype of your newborn baby Potato Head by looking at Table 2 "Key to Genotypes". Record the baby's genotype and phenotype in Table 1 below. (14 pts)

Table 1: Our Baby

Parent Allele			
Mom	Dad	Genotype (Allele combinations)	Phenotype (Gene expression- what the baby "looks" like)

Baby's Name _____

Table 2: Key to Genotypes

Genotype	Phenotype
AA	Long nose (purple)
Aa	Short nose (Orange)
aa	Oval nose
BB	Blue eyes
Bb	Purple eyes
bb	Black eyes
EE or Ee	Orange ears
ee	Pink ears
MM	Lips and tongue
Mm	Buckteeth
mm	missing teeth
TT	Yellow arms
Tt	White arms
tt	Blue arms
DD or Dd	Shoes(f), sneakers(m)
dd	Feet only
XX	Earrings
XY	Mustache

7. For how many of your traits was your baby Potato Head heterozygous? _____
Homozygous? _____ (1 pt each)

8. How many of your baby Potato Head's phenotypes were dominant? _____ recessive? _____
co/incomplete dominant _____ (1pt each)

6 points

9. Predict what 2 genotypes both mom & dad could have for each trait below, using the 1 chromosome from each your baby has. This is like working backwards from a Punnett Square. Then determine what their phenotype would be for each genotype. You will have two genotype answers each time and possible 2 phenotypes. (B could be paired with B, or b; so BB is blue eyes, Bb is purple) (36 pts)

example: SS/Ss-Skinless; ss-baked skin, or PP-mashed; Pp-roasted; pp-au' gratin

	Mom		Dad	
	Genotypes	Phenotypes	Genotypes	Phenotypes
Nose				
Eyes				
Ears				
Mouth				
Arms				
Feet				

10. Which parent determines the sex of the child? (1 pt) _____

Review & Analysis: Answer in complete sentences.

1. Compare and contrast the appearance of the babies in the nursery, what similarities and differences do you see? (3 pts)

_____

_____

_____

2. Use the results of this lab to explain how fraternal twins can look nothing alike. (2 pts)

_____

_____

_____

3. Calculate the chances of getting two baby Potato Heads that are exactly alike for the 7 pairs of chromosomes you used. (Ignore the possibility of identical twins). Show the steps you used in making your calculations. (3pts) (Remember your meiosis lab?)

4. Humans and many other organisms have more than 7 pairs of chromosomes and have thousands of different traits. Explain why it is so unlikely for two individuals to have the same genotype. (2 pts)

_____

_____

_____

/47 points possible

5. Why do members of a family, such as brothers, sisters, and cousins, look more similar that people who are not closely related? (2 pts)

_____

_____

_____

6. Why is genetic variation among individuals within a population important? (2 pts)

_____

_____

_____

7. Explain why some traits from mom and dad appear hidden even though offspring have the genes for that trait. (2 pts)

_____

_____

_____

6 points