Name:_____

Biology
LP 3 Day 6-10

# Genetics Project Part 1

Introduction:
Why do people look so different from each other? Even close relatives often look very different from each other. This happens because a very large variety of traits exist in the human population and new variations are created as humans reproduce. During meiosis (the process of producing gametes, sperm and egg) there can be reshuffling and even crossing over of genes between chromosome pairs. In this activity, we will learn why brothers and sisters have different **genotypes** (genetic messages on their DNA) and **phenotypes** (physical appearances), even when the share the same parents.

So… CONGRATULATIONS! You are a parent! You and a partner will represent a couple that each have one **dominant** and one **recessive** gene for each facial feature illustrated in this lab. Amazing coincidence, huh? As you already know, this means you are **heterozygous** for each trait.

Materials: A partner A penny/coin Colored pencils

Procedure:

1. Find a partner and the rest of your materials. Decide which of you will contribute the genes of the mother and with will contribute the genes of the father. **If you can't find a partner, do it yourself.**

2. Find out the sex of your child.
    - Remember your mom's genotype is XX and dad's is XY. The mother provides an X chromosome because that is all she has, and father provides either his X or his Y chromosome. So only Dad flips the coin.
    - Heads = Y sperm, which means the child will be a boy.
    - Tails = X sperm, which means the child will be a girl.

3. Give your bouncing baby a name.

4. Discover the facial features your child will have by flipping the coin as directed by the following pages. For purposes of the rest of the activity:
    - Heads will represent the **dominant** trait shown in capital letters.
    - Tails will represent the **recessive** trait shown in lowercase letters.

5. On your ***Face Lab Data Table*** record the genetic contributions (results from the flips of the coins) in the columns labels ***Gene(s) from Mother*** and **Gene*(s) from Father***. **Record the actual genetic message in the genotype column, and record the appearance in the phenotype column.**

6. Once you have finished determining all facial traits for your child, draw your child's **Senior Picture,** magnifying it so it takes up the entire space. When you have determined all the features of your child's face, draw and color the way your baby will look when he/she has reached their senior year of high school. Then, provide a **Senior Quote** to top off their yearbook photo.

7. Complete the analysis section of the lab. Then, attach the lovely drawing of your child to the data sheet and turn it in.

# Facial Features (USE AS YOUR REFERENCE)

1. Face Shape

Round (RR , Rr)

Square (rr)

2. Chin Shape

Prominent (PP, Pp)

Weak (pp)

3. Chin Shape II – only if your child's chin is prominent (PP, Pp)

Round Chin (RR, Rr)

Square Chin (rr)

4. Cleft Chin

Present (CC, Cc)

Absent (cc)

5. Skin Color:

Skin color involves 3 gene pairs. Each parent need to flip the coin 3 times, and record the A, B, and C alleles. For example the result of the first pair of coin flips might be AA, Aa, or aa. Record the first coin flip then do two more alleles B and C.

Each capital letter represents an active gene for melanin production (color).

| | |
|---|---|
| 6 capitals | Very dark black skin |
| 5 capitals | Very dark brown |
| 4 capitals | Dark brown |
| 3 capitals | Medium brown |
| 2 capitals | Light brown |
| 1 capitals | Light tan |
| 0 capitals | White |

6. Hair Color:

Like skin color hair color is produced by several genes (polygenic or multiple alleles). For the purpose of this activity we will assume that 4 pairs are involved (more are likely). So, each parent will have to flip the coins 4 times for the A, B, C and D alleles. As before, the capital letters (dominant) represent color while the lower case (recessive) represent little or no color.

| | |
|---|---|
| 8 capitals | Black |
| 7 capitals | Very dark brown |
| 6 capitals | Dark brown |
| 5 capitals | Brown |
| 4 capitals | Light brown |
| 3 capitals | Honey blond |
| 2 capitals | Blond |
| 1 capitals | Very light blond |
| 0 capitals | White |

7. Red Hair Color

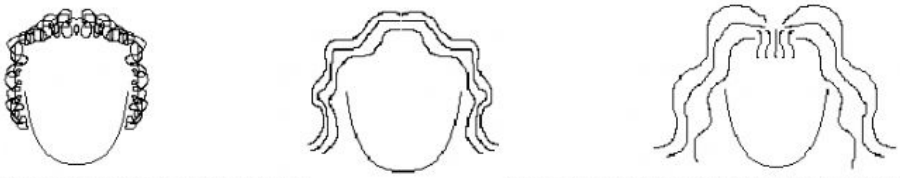
Red hair seems to be caused by a single gene with two alleles:

Dark red (RR) Light red (Rr) No red (rr)

Red hair is further complicated by the fact that brown hair will mask or hide red hair color. The lighter the hair color the more the red can show through. If your child has 3 or less capitals (for hair color, see number 6), and RR is tossed your child will have flaming red hair. (Have fun with your colored pencils!)

8. Hair Type: incomplete dominance

Curly (CC) Wavy (Cc) Straight (cc)



9. Widow's Peak: The hair comes to a point…like Eddie Munster

Present (WW, Ww) Absent (ww)

10. Eyebrow Color: incomplete dominance

Dark (DD) Medium (Dd) Light (dd)

11. Eyebrow Thickness: Bushy (BB, Bb) Fine (bb)

12. Eyebrow Placement: Not connected (NN, Nn) Connected

13. Eye Color:

Assume that there are two gene pairs involved, the capital letters represent more color and the lower case, less color. Dark eyes are dominant over light. Assume that there are two layers of color on the iris of the eye. The first alleles (A or a) code for the front of the iris and the second alleles (B or b) code for the back of the iris. Determine the first layer, A, then the second layer, B. In reality eye color is much more complex than this.

AABB Dark brown | Aabb Dark blue | aaBB Green | aaBb Grey blue
AABb Dark brown | AaBB Brown with green flakes | AaBb Hazel | aabb Light blue

14. Eye Distance:

Close together (EE) | Average (Ee) | Far apart (ee)

15. Eye Size:

Large (LL) | Average (Ll) | Small (ll)

16. Eye Shape:

Almond (AA, Aa) | Round (aa)

17. Eye Tilt:

Horizontal (HH, Hh) | Upward slant (hh)

18. Eyelashes:

Long (LL, Ll) | Short (ll)

19. Mouth Size:

Long (LL) | Average (Ll) | Short (ll)

20. Lip Thickness:

Thick (TT, Tt) | Thin (tt)

21. Lip Protrusion:

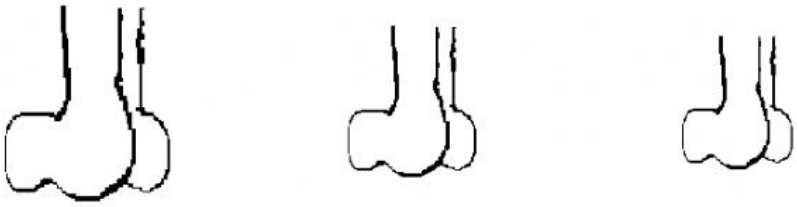
Very protruding (PP) | Slightly protruding (Pp) | Absent (pp)

22. Dimples:

Present (PP, Pp) | Absent (pp)

23. Nose Size:

Big (BB) Average (Bb) Small (bb)



24. Nose Shape: Rounded (RR, Rr) Pointed (rr)

25. Nostril Shape: Rounded (RR, Rr) Pointed (rr)

26. Earlobe Attachment:

Free (FF, Ff) Attached (ff)

27. Darwin's Ear Point:

Present (PP, Pp) Absent (pp)

28. Ear Pits:

Present (PP, Pp)

Absent (pp)

29. Hairy Ears: This sex-linked and only occurs in males so if your baby girl skip this. If yourbaby is a boy, only mom flips.

Present (P)

Absent (p)

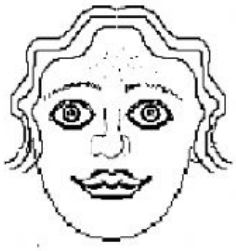
30. Freckles on Cheeks:

Present (PP, Pp)

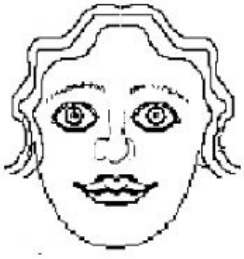
Absent (pp)

31. Freckles on Forehead:

Present (PP, Pp)



Absent (pp)



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**Parent Names:**

_____

_____ **Baby 's Name**_____

# Create A Face Lab Data Sheet

| Facial Trait | Genes from Mother | Genes from Father | chromosome pair Genotype | what it looks like Phenotype |
|---|---|---|---|---|
| **Gender of Baby** | X | X or y | XX or Xy? | (girl or boy?) |
| 1. Face Shape | R or r | R or r | RR or Rr or rr | round or square |
| 2. Chin Shape | | | | |
| 3. Chin Shape II | | | | |
| 4. Cleft Chin | | | | |
| 5. Skin Color<br>each parent flips 3 times | | | | |
| | | | | |
| | | | | |
| 6. Hair Color<br>each parent flips 4 times | | | | |
| | | | | |
| | | | | |
| | | | | |
| 7. Red Hair only if 3 or less capitals in hair | | | | |
| 8. Hair Type | | | | |
| 9. Widow's Peak | | | | |
| 10. Eyebrow Color | | | | |
| 11. Eyebrow Thickness | | | | |
| 12. Eyebrow Placement | | | | |
| 13. Eye Color | | | | |
| 14. Eye Distance | | | | |
| 15. Eye Size | | | | |
| 16. Eye Shape | | | | |
| 17. Eye Tilt | | | | |
| 18. Eyelashes | | | | |
| 19. Mouth Size | | | | |
| 20. Lip Thickness | | | | |
| 21. Lip Protrusion | | | | |
| 22. Dimples | | | | |
| 23. Nose Size | | | | |
| 24. Nose Shape | | | | |
| 25. Nostril Shape | | | | |
| 26. Earlobe Attachment | | | | |
| 27. Darwin's Ear Point | | | | |
| 28. Ear Pits | | | | |
| 29. Hairy Ears mom rolls, use if baby is boy | | | | |
| 30. Freckles on Cheeks | | | | |
| 31. Freckles on Forehead | | | | |

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## Genetics Project PART 2

### DRAW YOUR CHILD'S SENIOR PORTRAIT

**Directions**: The traits in this activity were used to illustrate how human heredity works in a simple model. In real life, the heritance of facial features is much more complex and is determined by the way several sets of genes work together. Create your child's high school senior portrait and complete the questions below to review the terminology associated with inheritance.

1. How much does **each parent** contribute to a child's genetic make-up?

**Define the following terms IN YOUR OWN WORDS:**

2. Genotype:

3. Phenotype:

4. Dominance:

5. Recessive:

6. Incomplete Dominance: *You may have to do some outside research for this! Or look at trait #8 in the list above.*

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## YOUR CHILD'S SENIOR PORTRAIT

Using your face lab data sheet, draw your child's senior portrait. **You will need to portray at least TEN traits from your data table onto your drawing. Bonus if you can portray all 31 traits!**

**NAME of child: _____**