STUDENT REFERENCE

The Genetics of Parenthood Guidebook

Why do people, even closely related people, look slightly different from each other? The reason for these differences in physical characteristics (called **phenotype**) is the different combination of **genes** possessed by each individual.

To illustrate the tremendous variety possible when you begin to combine genes you and a classmate will establish the genotypes for a potential offspring. Your baby will receive a random combination of genes that each of you, as genetic parents, will contribute. Each normal human being has 46 chromosomes (23 pairs-**diploid**) in each body cell. In forming the gametes (egg and sperm), one of each chromosome pair will be given, so these cells have only 23 single chromosomes (**haploid**). In this way, you contribute half of the genetics information (**genotype**) for the child: your partner will contribute the other half.

Because we don't know your real genotype, we'll assume that you and your partner are **heterozygous** for every facial trait. Which one of the two available alleles you contribute to your baby is random, like flipping a coin. In this lab there are 36 gene pairs and 30 traits, but in reality there are thousands of different gene pairs, and so there are millions of possible gene combinations!

PROCEDURES: Record all your work on EACH parent's data sheet.

- First, determine your baby's gender. Remember this is determined entirely by the father. The mother always contributes an X chromosome to the child.
  Heads = X chromosome, so the child is a **girl**
  Tails = Y chromosome, so the child is a **boy**
  Fill in the results on your data sheet.

- Name the child (first and middle name; last name should be the father's last name).

- Determine the child's facial characteristics by having **EACH** parent flip a coin.
  Heads = child will inherit the first allele (i.e. B or N_1) in a pair
  Tails = child will inherit the second allele (i.e. b or N_2) in a pair
  On the data sheet, circle the allele that the parent will pass on to the child and write the child's genotype.

- Using the information in this guide, look up and record the child's phenotype and draw that section of the face where indicated on the data sheet.

- Some traits follow special conditions, which are explained in the guide.

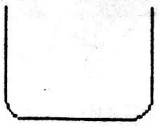
- When the data sheet is completed, draw your child's portrait, as he/she would look as a teenager. You must include the traits as determined by the coin tossing. Write your child's full name on the portrait.

The Genetics of Parenthood
Reference Sheets

1. **FACE SHAPE:**

Round (AA, Aa)

Square (aa)



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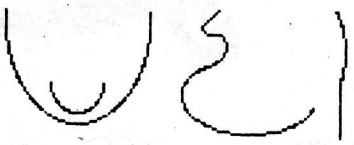
2. **CHIN SIZE:** The results may affect the next two traits.

Very prominent (BB, Bb)



Less prominent (bb)

3. **CHIN SHAPE:** Only flip coins for this trait if chin size is very prominent. The genotype bb prevents the expression of this trait.

Round (CC, Cc)

Square (cc)

4. **CLEFT CHIN:** Only flip coins for this trait if chin size is very prominent. The genotype bb prevents the expression of this trait.

Present (DD, Dd)

Absent (dd)

5. **SKIN COLOR:** To determine the color of skin or any other trait controlled by more than 1 gene, you will need to flip the coin for each gene pair. Dominant alleles represent color; recessive alleles represent little or no color. For example, if there are 3 gene pairs...
   a. First coin toss determines whether the child inherits E or e.
   b. Second coin toss decides F or f inheritance.
   c. Third coin toss determines inheritance of G or g.

   6 dominant alleles - black
   5 dominant alleles - very dark brown
   4 dominant alleles - dark brown
   3 dominant alleles - medium brown
   2 dominant - light brown
   1 dominant - light tan
   0 dominant - white

6. **HAIR COLOR:** Determined by 4 gene pairs.

   8 dominant - black
   7 dominant - very dark brown
   6 dominant - dark brown
   5 dominant - brown
   4 dominant - light brown
   3 dominant - brown mixed w/blonde
   2 dominant - blond
   1 dominant - very light blond
   0 dominant - silvery white

7. RED COLOR TINTS IN THE HAIR: This trait is only visible if the hair color is light brown or lighter (4 or less dominant alleles for hair color).

Dark red tint (L_1L_1) Light red tint (L_1L_2) No red tint (L_2L_2)

8. HAIR TYPE:

Curly (M_1M_1) Wavy (M_1M_2) Straight (M_2M_2)

9. WIDOW'S PEAK:

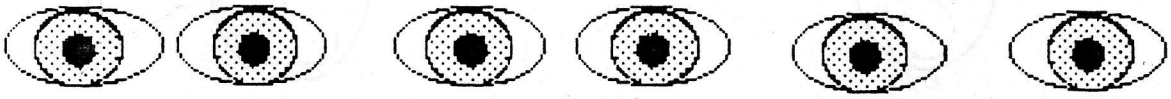
Present (OO, Oo) Absent (oo)

10. EYE COLOR:

PPQQ - black
PPQq - dark brown
PpQQ - brown with green tints
PpQq - brown
PPqq- violet
Ppqq - gray blue
ppQQ - green
ppQq - dark blue
ppqq - light blue

11. EYE DISTANCE:

Close (R_1R_1) Average (R_1R_2) Far apart (R_2R_2)

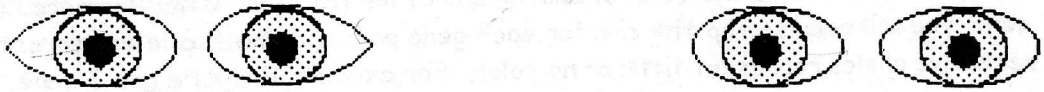


12. EYE SIZE:

Large (S_1S_1) Medium (S_1S_2) Small (S_2S_2)

13. EYE SHAPE:

Almond (TT, Tt) Round (tt)

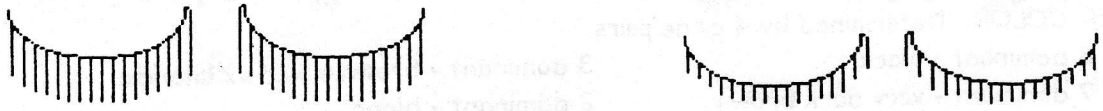


14. EYE SLANTEDNESS:

Horizontal (UU, Uu) Upward slant (uu)

15. EYELASHES:

Long (VV, Vv) Short (vv)



16. EYEBROW COLOR:

Darker than hair color (W_1W_1)

Same as hair color (W_1W_2)

Lighter than hair color (W_2W_2)

17. EYEBROW THICKNESS:

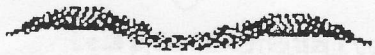
Bushy (ZZ, Zz)

Fine (zz)

18. EYEBROW LENGTH:

Not connected (AA, Aa)

Connected (aa)



19. MOUTH SIZE:

Long (B_1B_1)

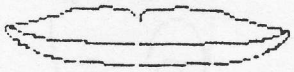
Medium (B_1B_2)

Short (B_2B_2)

20. LIP THICKNESS:

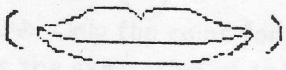
Thick (CC, Cc)

Thin (cc)

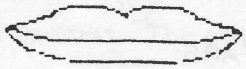


21. DIMPLES:

Present (DD, Dd)

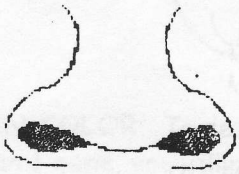


Absent (dd)

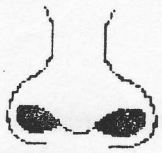


22. NOSE SIZE:

Large (E_1E_1)



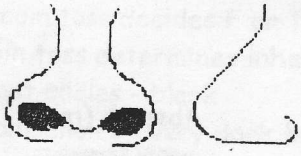
Medium (E_1E_2)



Small (E_2E_2)

23. NOSE SHAPE:

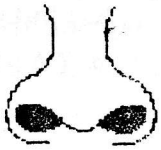
Rounded (FF, Ff)



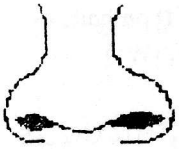
Pointed (ff)

NOSTRIL SHAPE:

Rounded (GG, Gg)

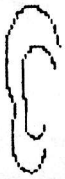


Pointed (gg)



5. EARLOBE ATTACHMENT:

Free (HH, Hh)



Attached (hh)

6 DARWIN'S EARPOINT:

Present (II, Ii)

Absent (ii)

27. EAR PITS:

Present (JJ, Jj)

Absent (jj)

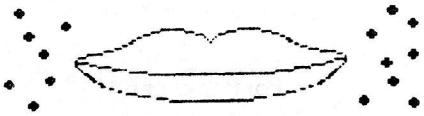
28 HAIRY EARS:

Present (KK, Kk)

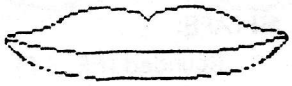
Absent (kk)

29. FRECKLES ON CHEEKS:

Present (LL, Ll)



Absent (ll)



30. FRECKLES ON FOREHEAD:

Present (MM, Mm)

Absent (mm)