Human Genetics: Create-a-Person

Have you ever wondered why people look so different? Even close relatives don't look exactly alike. This happens because a large variety of traits exist in the human population and new variations are created as humans reproduce. The reasons that people have very different genotypes- genetic messages, and phenotypes- physical appearances, will be explored in this activity. This activity is intended to be used after you have the results from the **Human Genetics Self-Assessment of Genotype** activity. So you will need the lab data sheet from that activity.

CONGRATULATIONS! YOU ARE GOING TO BE A PARENT- *pretend*

You and your lab partner (find a partner of the opposite gender if possible) represent a couple that is expecting a child. Naturally you want an idea of what to expect. You will each need a coin and together will create a common lab data sheet for this activity.

To determine the facial appearance and abilities of your child, you and your partner will each flip a coin to determine which bit of information- allele (n) you will contribute to the child for each trait or gene. The flip of the coin will determine which allele from each genotype pair you contribute to the child. The child gets two alleles (2n) for each gene or trait, one from each parent. If you don't like the result, too bad! You only get one chance.

HEADS will represent the first letter of each genotype represented by 2 letters.

TAILS will represent the second letter of each genotype represented by 2 letters.

Note: This activity covers only a very few human traits and in almost all cases, it is much more complicated in reality. Also, the dominance and recessiveness of the traits is not necessarily real but simply used here for this exercise. Do NOT expect the results of this to actually come true and DO NOT TEST this activity in real life!

PROCEDURE:

1. Use **Create-a-person LAB DATA SHEET** to record the genetic contribution- coin flip results from the options in the Human Genetics- Self-Assessment of Genotype Lab results sheet for each parent.

2. Determine the sex of your child. Remember Mom's genotype is XX and Dad is XY. ONLY DAD flips a coin- **Heads represent a Y sperm and the child is a boy. Tails represent an X sperm and the child is a girl**. Do it now and at the top of your data sheet, write down the gender of your child.

3. Give your child a name and record that at the top of your data sheet also.

4. Determine the rest of the genetic features by following the steps.

Steps: Each person consults their own self-assessment data sheet in order of traits. For each pair of letters, each person flips a coin to determine which of the two they have that they will contribute to this child. **If heads, the first letter of the two is contributed. If tails, the second**. This needs to be recorded in he correct column 'allele from mother' or 'allele from father'. Next, combine (during fertilization) the letters in the 'child genotype' column. Then translate the child genotype into the appearance according to the child genotype and record that under the 'child phenotype' column.

FACE (1-4):

1. FACE SHAPE:

ROUND (RR, Rr) SQUARE (rr)

2. CHIN SHAPE:

VERY PROMINENT (VV, Vv) LESS PROMINENT (vv)

3. CLEFT CHIN: DO THIS ONLY IF A VERY PROMINENT CHIN this feature does not go with a less prominent chin. (The suppression of this trait is called *epistasis*)

PRESENT (AA, Aa) ABSENT (aa)

4. SKIN COLOR:
Skin color involves three gene pairs and is therefore an example of *multifactorial inheritance*.
Flip your coins three times, once for each of the pairs of letters you have.

For example, your genotype may be AABbCc. If so, the first pair is AA. Since in either case you will contribute a capital 'A', you do not need to flip but you need to record the 'A'. For the next set, 'Bb' you need to flip. If you flip tails, you have contributed the 'b' and must record it. For the final pair, you must also flip. If you get heads, you have contributed the 'C' allele and must record it. So under your column, you should have 'AbC'. At the same time, your partner is doing the same thing for their data. Then, you combine the results and count the capital letters to determine the phenotype. Follow this same procedure for each trait that is expressed with *multifactorial inheritance* (more than one pair of letters in the genotype).

Each capital letter represents an active gene for pigmentation.

6 capitals	very dark black skin
5 capitals	very dark brown
4 capitals	dark brown
3 capitals	medium brown
2 capitals	light brown
1 capital	light tan
0 capitals	white

HAIR TRAITS (5-8):

5. HAIR COLOR:
Like skin color, hair color is produced by several genes (polygenic or multifactorial). Look up the four pairs shown on your lab data sheet for this trait and flip the coins four times of needed to record which of one of the two letters (alleles) you contribute. Capitals represent color pigment and lower case represent genes with little or no pigment.

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 capital	very light blond
0 capitals	white

6. RED HAIR:

RED HAIR seems to be caused by a single gene with two alleles RED (R) or no red (r) and displays incomplete dominance. This means that a person with ***RR*** **will have very dark red hair,** and ***Rr*** **will be a lighter red and** ***rr*** **will have no red in their hair**.

RED HAIR is further complicated by the fact that brown will mask or hide the red color. The lighter the hair color in number 6 the more red that shows. **If your child has three capitals or less for hair color and RR is tossed here the child probably has flaming red hair or dark red hair**. This one takes some imagination and creativity in coloring.

7. HAIR SHAFT SHAPE:

4 capitals	tight curls
3 capitals	loose curls
2 capitals	wavy
1 capital	some wave
0 capitals	straight

8. WIDOW'S PEAK: The hairline comes to a point in the center of the forehead.

PRESENT (WW Ww) ABSENT (ww)

EYEBROW TRAITS (9-11):

9. EYEBROW COLOR: Remember that the eyebrow color is relative to and will be close to the hair color.

VERY DARK (HH) MEDIUM DARK (Hh) LIGHT (hh)

10. EYEBROW THICKNESS:

BUSHY (BB) NEITHER BUSHY OR FINE (Bb) FINE (bb)

11. EYEBROW PLACEMENT:

NOT CONNECTED (NN) SOME CONNECTION (Nn) CONNECTED (nn)

EYES (12-18):

12. EYE COLOR: Assume there are two gene pairs involved. Assume there are two layers of color on the iris of the eye. The first capitals represent the front of the iris and the second pair represents the back of the iris.

4 capitals	very dark brown
3 capitals	brown
2 capitals	light brown
1 capital	blue
0 capitals	pale blue or gray

NOTE: EYE COLOR IS MUCH MORE COMPLEX THAN THIS.

13. GREEN AND YELLOW:
As with red hair, eyes may also show green or yellow in the iris of lighter colored eyes. Assume that if either of these colors is present then eye color is lighter and should be represented by another 2 genes.

4 capitals	very green
3 capitals	some green present
2 capitals	some green and some yellow
1 capital	no green but yellow ring, flecks, or streaks visible
0 capitals	no green or yellow

14. EYE DISTANCE APART:

CLOSE TOGETHER (EE) AVERAGE DISTANCE (Ee) FAR APART (ee)

15. EYE SIZE:

LARGE (EE) MEDIUM (Ee) SMALL (ee)

16. EYE SHAPE:

ALMOND (AA) SOMEWHAT ALMOND (Aa) ROUND (aa)

17. EYE SLANTEDNESS (FROM NOSE TO OUTSIDE):

DOWNWARD SLANT (DD) HORIZONTAL (Dd) UPWARD SLANT (dd)

18. EYELASHES:

LONG (LL, Ll) SHORT (ll)

MOUTH AND LIP TRAITS (19-21):

19. MOUTH OPENING SIZE:
LARGE (LL) AVERAGE (Ll) SMALL (ll)

20. VISIBLE LIP THICKNESS:

VERY VISIBLE (TT) VISIBLE (Tt) THIN OR NOT VERY VISIBLE (tt)

21. LIP PROTRUSTION:

VERY PROTRUDING (PP) SLIGHTLY PROTRUDING (Pp) PROTRUSTION ABSENT (pp)

22. DIMPLES IN CHEEKS

PRESENT (DD, Dd) ABSENT (dd)

NOSE TRAITS (23-25):
These judgments are relative to all people, not just others within the same racial stock. In reality, differences may be subtle.

23. NOSE SIZE:

BIG (BB) MEDIUM (Bb) SMALL (bb)

24. NOSE SHAPE:

HOOKED (HH) STRAIGHT (Hh) SKI JUMP (hh)

25. NOSTRIL PROTRUSTION:

WIDE AND ROUNDED (RR) MEDIUM (Rr) NARROW (rr)

EARS (26-28):

26. EARLOBE ATTACHMENT:

FREE (FF, Ff) ATTACHED (ff)

27. DARWIN'S EAR POINT: **The top of the ear is pointed instead of rounded.**

PRESENT (DD, Dd) ABSENT (dd)

28. HAIRY EARS: Hairy ears are sex linked to the x chromosome and sex influenced so that it only occurs in males. As it is a recessive trait, B represents bald ears. Why is there an 'o' present in male genotypes?

Male:	HAIR PRESENT (bo)	HAIR ABSENT (Bo)
Females:	HAIR PRESENT GENE (bb)	HAIR ABSENT GENE (BB or Bb)

FRECKLES (29 and 30):

29. FRECKLES ON CHEEKS:

PRESENT (FF, Ff) ABSENT (ff)

30. FRECKLES ON THE FOREHEAD:

PRESENT (FF, Ff) ABSENT (ff)

CREATE A PERSONALITY: For each type of intelligence listed below (traits 31-36), determine the level of intelligence. These are multifactorial forms of inheritance too.

INTELLIGENCES (31-36):

31. VERBAL INTELLIGENCE
32. MATH/LOGICAL INTELLIGENCE
33. SPATIAL/ARTISTIC INTELLIGENCE
34. ATHLETIC INTELLIGENCE
35. MUSICAL INTELLIGENCE
36. INTERPERSONAL INTELLIGENCE

6 capitals	extremely high
5 capitals	high
4 capitals	higher than normal
3 capitals	normal
2 capitals	below normal
1 capital	low
0 capitals	extremely low

BODY (37-41): Although these traits are determined by many genes, thus creating a wide range of expressions, we will simplify here using only one incompletely dominant gene.

37. HEIGHT:

TALL (TT)	MEDIUM (Tt)	SHORT (tt)

38. BONE SIZE: This trait also correlates how much muscle mass a person will tend to carry.

LARGE OR THICK BONED (LL)	REGULAR (Ll)	SMALL OR PETITE (ll)

39. WEIGHT:

OVERWEIGHT (OO)	NORMAL (Oo)	UNDERWEIGHT (oo)

40. SKIN THICKNESS: How visible are underlying muscles? If every ripple can be seen, then skin is thin. Remember, for females this is relative to other females, not to males as the normal female layer of fat under the skin softens and masks underlying muscles.

THICK SKIN (TT)	NORMAL (Tt)	THIN SKIN (tt)

41. TONGUE ROLLER: The ability to roll your tongue longitudinally – an indicator of success.

TONGUE ROLLER (SS, Ss)	NONTONGUE ROLLER (ss)

EXTRA CREDIT! If you want to identify more traits, consult with your teacher to add to this list. If you have or are a known carrier for a genetic disease or condition, you may add that trait also, especially if you know the genotype for its expression.

NOW DRAW YOUR CHILD'S HIGH SCHOOL PICTURE: To do this, look at the phenotype column from your data table and construct your drawing and color the way your baby will look when she/he has reached Early ADULT AGE.

CAREER:
Now forecast he best career choice for your grown child. Use the strongest intelligence or combination of intelligence to determine career directions. Don't forget the appearance of your child as it may have an impact on their career. Write the name of your child and her/his career on your drawing and be able to defend your career choice when you introduce your child.
ATTACH YOUR DATA SHEET AND YOUR GROWN CHILD'S PORTRAIT.