Human Genetics: Self-Assessment of Genotypes

You and your lab partner need to take turns helping each other determine the genotype for each of the following traits. You will need a coin, pencil, a **Self-Assessment Survey Data Sheet** and maybe a mirror.

PROCEDURE:

1. Put your name on your Lab Data Sheet and indicate your gender as male or female along with your sex chromosomes arrangement. ***XX for female*** and ***XY for male***.
2. Go through the list of traits in order and fill in each column in your data sheet for each trait. Check your determinations with your lab partner and if needed look in a mirror or at a photo of yourself. Be as painfully honest as possible. If a trait has both a homozygous dominant genotype (2 CAPTIALS) and a heterozygous genotype (1 CAPITAL and 1 lower case) for your phenotype, **then flip a coin to determine which genotype is yours. Heads = homozygous dominant, tails = heterozygous**.

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 YOU HAVE A VERY PROMINENT CHIN. This feature does not go with a less prominent chin. (This suppression of a trait is called epistasis)

PRESENT (AA, Aa)	ABSENT (aa)

4. SKIN COLOR:

Skin color involves three gene pairs and is therefore an example of polygenic inheritance or multifactorial inheritance. A, B, and C. Each capital letter represents an active gene for pigmentation.

AABBCC	very dark black skin
AABBCc	very dark brown
AABbCc	dark brown
AaBbCc	medium brown
AaBbcc	light brown
Aabbcc	light tan
aabbcc	white

HAIR TRAITS (5-8):

5. HAIR COLOR:

Like skin color, hair color is produced by several genes (polygenic or multifactorial). Assume that four pairs are involved; A, B, C, and D. Capital letters represent color pigment, whereas lower case represent genes with little or no pigment.

AABBCCDD	black	AaBbCcdd	honey blonde
AABBCCDd	very dark brown	AaBbccdd	blonde
AABBCcDd	dark brown	Aabbccdd	very light blonde
AABbCcDd	brown	aabbccdd	white
AaBbCcDd	light brown		

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 5, the more red that shows. If you have natural red in your hair, the amount of red (flaming red hair or dark red hair) indicates the probable genotype. **For example, the more red, the more capitals. (*RR* whereas no red would be *rr*) This one takes some imagination and creativity in coloring.**

7. HAIR SHAFT SHAPE: This will be determined by two genes.

AABB	TIGHT CURLS
AABb	LOOSE CURLS
AaBb	WAVY
Aabb	SOME WAVE
aabb	STRAIGHT

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

CLEARLY PRESENT (WW) SOMEWHAT PRESENT (Ww) ABSENT (ww)

<u>EYEBROW TRAITS (9-11)</u>:

9. EYEBROW COLOR: remember that the eyebrow color will be close to the hair color so the following choices are relative to 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)

<u>EYES (12-18)</u>:

12. EYE COLOR: Assume there are two gene pairs involved, the capital letters represent pigment or color and the lower case represent less color.

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 represent the back of the iris. Determine the first layer A and then the second layer B.

AABB	very dark brown
AABb	brown
AaBb	light brown
Aabb	blue
aabb	pale blue or gray

NOTE: IN REALITY 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.

AABB	Very green
AaBB	Some green present
AaBb	Some green and some yellow
Aabb	No green but yellow ring, flecks, or streaks visible
aabb	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 PROTRUSION:

VERY PROTRUDING (PP) SLIGHTLY PROTRUDING (Pp) PROTRUSION 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 POSITION:

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 a sex- linked to the x chromosone and sex influenced so only occurs in males. As it is a recessive trait, B represents bald ears. Girls, flip a coin for present or absent gene.
If absent, flip again for homozygous or heterozygous.

Males:	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 FOREHEAD:

PRESENT (FF, Ff)	ABSENT (ff)

INTELLIGENCES (31-36):

For each type of intelligence **listed below (traits 31- 36)**, determine the level of your intelligence and indicate with 3 letters for 3 genes (A, B, and C) with dominant as higher- intelligence. Record the results on your table. If you have taken a multiple intelligences test, use those results to determine the genotype from the options below. **If not, choose your level of intelligence based on what you know about yourself – be as honest as possible!**

AABBCC	extremely high	AaBbcc	below normal
AABBCc	high	Aabbcc	low
AABbCc	higher than normal	aabbcc	extremely low
AaBbCc	normal		

INTELLIGENCE TRAITS:

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

BODY (37-41): Although these traits are determined by many genes, (multi-factorial inheritance), thus creating a wide range of expressions, we will simplify here using only one incompletely dominant gene. Therefore, use your closest guess as what you expect to be as an adult.

37. HEIGHT:

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

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

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

39. WEIGHT: **As an adult, do you think you will tend to fight weight gain or not? Consider your parents' phenotype.**

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 the underlying muscles.

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

41. TONGUE ROLLER: Do you have the ability to roll your tongue longitudinally?

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

Note: This survey 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 above traits is not necessarily real but simply used here for this exercise.

EXTRA CREDIT! If you want to identify more traits, consult with the 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.