

GRADE 12 BIOLOGY

UNIT A – BIOLOGICAL INHERITANCE

TEN INHERITABLE TRAITS

Which traits did you inherit from your mother? from your father? Take this simple genetic survey and learn about the genes that you possess.

The most fun way to learn a little about genetics is to understand heredity first hand, your own heredity; and you can do that by examining the actual **dominant** and **recessive** traits that you display.

Genes from Mom & Dad Determine Your Traits

You are a *diploid* organism, meaning that you received one set of genes for a particular trait (called **alleles**) from your father and the other set of alleles from your mother.

The combination of these pairs of genes that you've inherited is called your **genotype**. Your genotype (DNA) determines the actual traits (called the **phenotype**) that you display; such as eye color, nearsightedness, and whether or not you have dimples.

Some Genes Mask the Expression of Other Genes

In some instances, the version of a gene that you get from one parent may block the expression of the version of that same gene you received from the other parent. [Like rock-paper-scissors!]

This is a case of a dominant allele masking the expression of a recessive allele. Recessive alleles are only expressed if you inherit two of them, one from each parent.

For example, if your mother has brown eyes and your father has blue eyes (non-brown), you *may* have ended up with brown eyes (75% chance). Your father's blue eyes are a recessive trait, and although you have an allele for blue eyes, the dark eye allele that you received from your mother masks the expression of the blue eye, recessive allele. Where the 'chance' comes in will be for our further investigation.

It is kind of like the game Rock, Paper, Scissors, but in this case, brown beats non-brown. The brown allele **dominates** over the non-brown allele. If you have blue eyes, you had to have inherited a recessive, non-brown eye allele from both parents. Or think of it as trump card in a card game.

Simple Inheritance Traits of Complete Dominance

There are many inheritable traits, including:

- facial dimples
- bent little finger
- eye color
- hand clasping
- early onset myopia
- cleft chin
- achoo syndrome

See below which displayed traits apply to your family members some day!

1. **Achoo Syndrome:** [medical term: ‘Autosomal Dominant Compelling Helioophthalmic Outburst’] This dominant trait is also called the photo sneeze reflex. If, when suddenly exposed to light, you sneeze (usually two or three times) you have the genes for achoo syndrome. Next time you go to a movie, exit the dark theatre through a door that leads directly outside. It's fun to wait outside and watch the people emerge from the movie. Some will sneeze as soon as they are exposed to light.

Display (have it) ___ **Do not Display** (don't have it) ___

2. **Chin Cleft:** A prominent cleft in the chin is due to the bond structure which underlies the Y-shaped fissure of the chin. Females appear to be less conspicuously affected than males.

Display (have it) ___
Do not Display (don't have it) ____.



3. **Early Onset Myopia (Childhood Nearsightedness):** Nearsightedness, or myopia, is a complex trait with at least 4 gene loci involved, however the heritability of myopia is very high and shows a dominant pattern.

Display (have it) ____ **Do not Display** (don't have it) ____.

4. **Bent Little Finger:** A **dominant** allele causes the last joint of the little finger to dramatically bend inward toward the 4th finger. Lay both hands flat on a table relax your muscles, and note whether you have a bent or straight little finger.



Display (have it) ____.
Do not Display (don't have it) ____.

5. **Facial Dimples:** Not sure if you have them? Smile! With dominant phenotype, you may have a dimple on one side, or on both.

Display (have it) ____.
Do not Display (don't have it) ____

6. **Eye Color:** Eye color, as well as hair and skin, is a complex trait; not a case of simple inheritance. The main pigment is melanin, and the more melanin, the darker the color. Although the genetics of eye color is complex, alleles for production of melanin dominate those for lack of melanin. So if we evaluate eye color as blue (recessive) or non-blue (dominant), it can be treated as a characteristic of simple inheritance.

Display (have it) ____.
Do not Display (don't have it) ____

7. **Free Earlobe:** The dominant trait is for lobes to hang free, a bit of lobe hanging down prior to the point where the bottom of the ear attaches to the head. With the recessive phenotype, the lobes are attached directly to the head.

Display (have it) ____

Do not Display (don't have it) ____.



Detached



Attached

8. **Hand Claspng:** Clasp your hands together (without thinking about it!). Most people place their left thumb on top of their right and this happens to be the dominant phenotype. Now, for fun, try clasping your hands so that the opposite thumb is on top. Feels strange and unnatural, doesn't it?



Display (have it) ____

Do not Display (don't have it) ____.

9. **Mid-digital Hair (Hairy Knuckles):** Some people have hair on the middle segment of one or more of their fingers, while others don't. Having any hair there at all means that you have the dominant phenotype. Complete absence of hair is recessive.

Display (have it) ____

Do not Display (don't have it) ____

10. Tongue Rolling: If you have the ability to roll the sides of your tongue upwards to form a closed tube, you have the dominant phenotype for this motor skill. Those who are not dominant for this trait cannot roll their tongue, no matter how hard they may try.



Display (have it) ___

Do not Display (don't have it) ____.

Ethno-cultural Traits. There is extensive research in the genetics of the world's ethnic groups. Some ethnic groups are more prone to adult onset diabetes for example. Some groups have distinctive facial features, skin tones, hair. It is certainly a fascinating field.

Race. It is important to realize there are very few scientists who actually use the word 'race' because it is a non-scientific distinction!

Are all traits governed by Genetics?

No, the environment and/or cultural practice can influence traits. For example, whether you are right-handed or left-handed may be influenced by religion. Ask anybody who went to certain religious schools before the 70's!

Other Traits. There are supposedly many inheritable traits. Freckles, curly hair, alcoholism (?), hairy knuckles, bent baby finger, hitch-hikers thumb, six fingers or toes, ear wiggling, taste of broccoli bitter or not, hair line, blood type, colour blindness, second toes longer than big toe, ...stinky pee when you eat asparagus, lots of ear wax and body odour (they go together apparently?)

See if you can find other human traits! (from a **credible source!**)