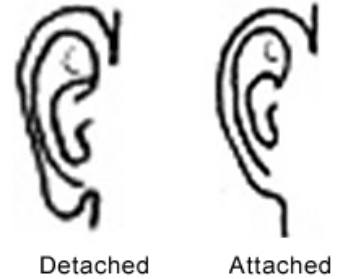


Inheritance Patterns Study Guide

Dominant/Recessive Basics

- The shape of human earlobes is an inherited trait. Jana and her father have detached earlobes, while her mother's earlobes are attached. Jana's ear shape is determined by genes which contain the information for the earlobe trait.
- A certain species of rose can be dark yellow (r), or light yellow (R). If a rose has the alleles Rr and is light yellow in color, which allele is dominant?



~light yellow, R

- The round pea seed trait is dominant over the wrinkled pea seed trait. If a pea seed is wrinkled, which combination of alleles must it have?

~two wrinkled alleles (two recessive alleles)

- An organism's genotype describes its genetic composition. An organism's phenotype describes its appearance or observable characteristics.
- A rabbit is carrying a dominant allele for brown fur (B) and a recessive allele for white fur (b). What is the rabbit's phenotype?

~brown fur

- Being tall is a dominant trait. Being short is a recessive trait. What can you determine about the parents of a tall plant?

~at least one parent plant must also be tall to pass the tall (T) allele on to the offspring; both parent plants could be tall, but it would be impossible for two short parent plants to produce a tall offspring

- Green pod color is a dominant trait, while yellow pod color is recessive. How would you write a heterozygous genotype?

~Gg (heterozygous means 2 different alleles: one dominant (capital) and one lowercase (recessive))

- Tall plant height is dominant over short plant height. What genotypes could represent a tall plant?

~TT or Tt (as long as there is one dominant allele present, the dominant allele will take over and the organism will have the dominant (tall) trait)

Punnett Squares

- Freckles (F) are a dominant trait. The Punnett square for a non-freckled parent and a heterozygous freckled parent is shown. What is the probability that their children will have freckles?

~50% (2 out of 4 possible offspring will have a genotype (Ff) that results in a dominant phenotype. ff = recessive non-freckled offspring)

	F	f
f	Ff	ff
f	Ff	ff

- The Punnett square shows the cross between cabbage butterflies. B = white and b = yellow. Why are all the offspring white?

~Because one parent was homozygous dominant, that parent passed a dominant allele to each offspring, which took over and caused the offspring to have the dominant trait.

Cabbage Butterflies

	B	B
b	Bb	Bb
b	Bb	Bb

	R	R
R	RR	RR
R	RR	RR

11. In humans, the ability to roll one's tongue is dominant over the allele for non-tongue-rolling. If two homozygous parents can roll their tongues, what is the probability their child will also be able to roll their tongue?

~homozygous dominant parents means each parent has 2 dominant (rolling tongue) alleles. Therefore, each parent has no choice but to pass on those dominant alleles to their offspring (RR). All offspring, 4/4 will also be homozygous and able to roll their tongues.

12. Having smooth seeds is a dominant trait. Having wrinkled seeds is a recessive trait. What do you know about the offspring of two plants with wrinkled seeds?

~two plants with wrinkled seeds must have a genotype with two recessive alleles. Therefore, the parents will only be able to pass recessive (wrinkled seeds) on to their offspring. The offspring MUST have the recessive trait and will have wrinkled seeds.

13. In a gerbil population, the allele for coarse fur (F) is dominant, while the allele for smooth fur (f) is recessive. One pet store found that most of their customers want coarse-furred gerbils. Which cross would produce the greatest number of coarse-haired offspring?

- Ff X Ff
- ff X ff
- Ff X ff
- FF X Ff

14. A red flower (RR) is crossed with a white flower (rr) and produces plants with red flowers – if two of these red flower **offspring** are crossed together, what color offspring would be produced? (**Hint:** this is a TWO step problem. First you have to cross the parents: RR X rr, then you have to choose two of the **offspring** to cross.)

~After crossing the parents (RR x rr), all offspring will have a heterozygous genotype (Rr). By crossing two of the offspring, both red (75%; RR or Rr) and white (25%; rr) could be produced.

	R	r
R	RR	Rr
r	Rr	rr

15. In rabbits, long ears (L) are dominant over short ears (l). The diagram shows the cross of a homozygous dominant parent (LL) with a parent of an unknown genotype for ear length. What is the unknown genotype and phenotype for the parent?

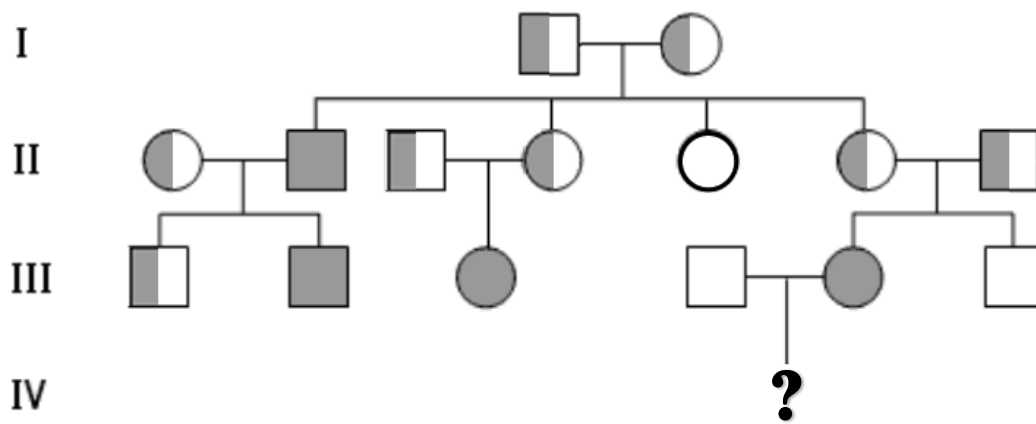
~One parent is LL, therefore, the only alleles left are ll, which would result in a homozygous recessive genotype and short ears phenotype

	L	L
?	Ll	Ll
?	Ll	Ll

Pedigrees

Use the pedigree pictured below to answer the following questions.

The pedigree below shows the inheritance of albinism in a particular family. The shaded symbols represent individuals with albinism. People with albinism have little or no pigment in their skin, eyes, and hair color. The allele for normal pigmentation (A) is dominant over the allele for albinism (a).



16. What are the genotypes of the parents in the 1st generation?

~Each parent is a heterozygous carrier (Aa) for albinism, because each of the shapes in the first generation are 1/2 shaded (indicating one dominant allele and one recessive allele).

17. What will be the genotype of the offspring in the 4th generation?

~Aa (the parents are AA x aa)

18. How many **people** in this family will have the recessive phenotype?

~4 (there are 4 completely shaded shapes in the pedigree)

19. How many **blood-related grandchildren** do the parents in the 1st generation have?

(**Hint:** Do not count people who married into the 3rd generation.)

~5 (the 6th person in the 3rd generation married into the family)

20. Which of the following is NOT true about symbols in a pedigree?

- Circles represent males and squares represent females.
- A square and circle connected at the sides indicate marriage (offspring was produced).
- Shaded shapes have the recessive trait.
- Half shaded shapes are carriers (heterozygous) for the trait.

21. How many females are carriers for albinism in this family?

~4 (female carriers are 1/2 shaded circles)

22. The unmarried person in the 2nd generation is worried about having offspring with albinism. Who should this person marry to ensure the offspring will NOT have albinism?

- homozygous person with albinism (bb)
- heterozygous person without albinism (Bb)
- homozygous person without albinism (BB)
- any of the above – the dominant allele will take over