

## Genetics Concept Questions

1. Explain why it is fair to say that serendipity played a big part in Mendel's choice of the garden pea.
2. Explain how the dominant phenotype can have more than one genotype.
3. A mother has two alleles for a given trait. State the number of alleles for the trait she would give to an offspring. Identify the principle of genetics that describes this.
4. Plants grown by vegetative propagation (*i.e.*, by cuttings) have exactly the same traits as the parent plants. Plants grown from seeds may vary from the parent plants in many ways. Explain these two observations.
5. Describe the relationship between genes, proteins and heritable traits.
6. Identify the principle of genetics that states the inheritance of one characteristic does not affect the inheritance of another.
7. A student claims the height of a pea plant affects the color of its flowers. Provide reasoning to support or refute this claim.
8. A student claims an individual can be heterozygous for a trait and show the recessive phenotype. Provide reasoning to support or refute this claim.
9. Of all the chromosomes in one of your cells, half came from each of your parents. Identify the fraction that came from each of your grandparents. Identify the fraction that came from each of your great-grandparents.
10. In a cross between a homozygous dominant and a homozygous recessive parent, there are 32 offspring in the F<sub>2</sub> generation. Predict the number of offspring you would expect to show the recessive trait.
11. a) Describe a test cross and why it would be used.  
b) Explain the two possible outcomes and what it tells you.
12. In sheep, white coat is dominant. Black is recessive. Occasionally, a black sheep appears in a flock. Black wool is worthless. Describe how a farmer could eliminate the genes for black coat from the flock.
13. In a certain animal, one variety always has a hairy tail while another always has a naked tail. Explain how you would determine which trait is dominant.
14. A couple has three sons and one daughter. Calculate the probability that a fifth child will be female. Provide reasoning for your response.
15. Explain how probability can be used in genetic counseling.
16. Explain why a large sample is more statistically reliable than a small sample.
17. A white cow and a red bull mate and produce a roan calf.

- a) State the genotype of the roan calf.  
b) Predict whether a roan cow and roan bull can mate and produce all roan calves. Provide reasoning for your prediction.
18. A flower grower is looking for new varieties of petunias. He crosses a yellow flower plant with a blue one and gets green flowered plants. Explain how this is possible.
19. Mary has blood type A and she marries John, whose blood type is B. They have three children: Joan, James and Pete. Joan has blood type O, James has blood type A, and Pete has blood type B. Explain how this is possible.
20. A man with type O blood marries a woman who is heterozygous for type B blood.  
a) Predict the probability of them having a child with type B blood.  
b) Predict the probability of them having a child with type O blood.
21. Mr. and Mrs. Doe had a child named Flo at the same time Mr. and Mrs. Roe had their son Joe. The Roes took Joe home, and after looking at him they claimed that Joe was not their child. They were going to sue the Hospital for the mix up. The Hospital took the blood types of all six individuals to try and prove there was no mix up. The results of the tests were as follows: Mr. Roe had A blood type; Mrs. Roe had A blood type; Joe had O blood type; Mr. Doe had O blood type; Mrs. Doe had AB blood type and Flo had A blood type. Provide reasoning to support or refute the Roes' claim that Joe was not their child.
22. Huntington's chorea is a dominant neurological disorder that usually appears when a person is between 35 and 45 years of age. Many people with Huntington's chorea, however, do not show symptoms until they are well into their sixties. Explain how the slow development of the disease explains why it has not been eliminated by natural selection.
23. Provide a reason for the importance of identifying the alleles which cause genetic disorders.
24. In most cultures, it is unacceptable to marry your immediate relatives. Using the principles of genetics, explain why inbreeding in humans is discouraged.
25. a) Explain what is meant by saying that genes are linked.  
b) Identify the law of inheritance that linked genes violate.
26. Describe the cause of incomplete linkage.
27. Propose a reason for the observation that there are more males with sex-linked genetic disorders than females.
28. For humans, identify which parent determines the sex of the offspring. Provide reasoning for your response.
29. While examining a population of fruit flies, you notice that a certain trait never appears in males. Provide reasoning to explain this observation.