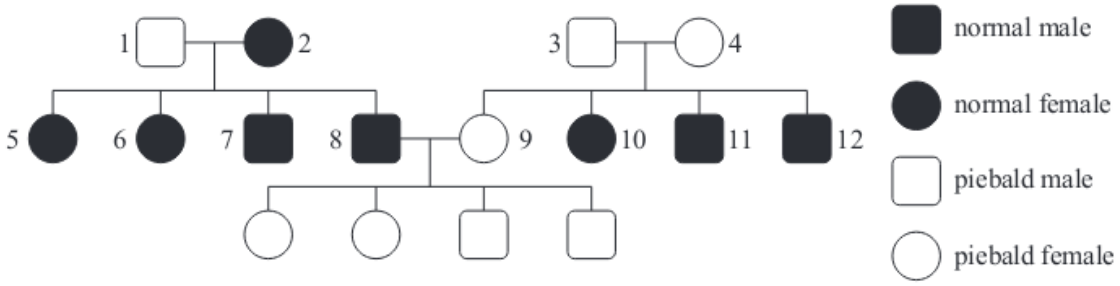
NCEA Level 1 Science (Genetics #2)

This worksheet is on inheritance and genetic variation.

Questions

1. What is the difference between a phenotype and a genotype?
2. In pea plants, purple flowers (P) are dominant to white flowers (p). Give the genotype of a plant with white flowers. Is the genotype heterozygous or homozygous?
3. A person with dimpled cheeks has the genotype DD or Dd. A person with smooth cheeks has the genotype dd. Which trait is dominant? If two people with dimpled cheeks carrying the recessive gene reproduce, what is the chance of the offspring having smooth cheeks?
4. Explain why 'pure breeders' always have a homozygous genotype.
5. White colour is the dominant trait in sheep. Explain, with reference to a Punnett square, how a white ram and a white ewe could have a black lamb.
6. Jim is able to taste the bitter chemical in the pith of a grapefruit (white layer between skin and fruit) but Emma cannot. They have four children; Jack and Anna can taste the fruit, but Mary and Peter cannot. The dominant trait is tasting (B).
   (a) Give the genome for each family member.
   (b) Explain your genome choice for Jim, Emma, and Anna.
   (c) Suppose Peter has a child with Sonya. What is the chance that their offspring is able to taste the chemical?
7. [NZQA 2017] Piebaldism is a genetic condition causing a white patch on the head and body of horses. In horses piebaldism is a dominant trait (H), and "normal" colour is recessive (h).



   (a) From the pedigree chart above, list all the possible phenotypes and genotypes of horses 3, 8, and 9.
   (b) A breeder wants to produce only dominant (piebald) offspring from a breeding pair of horses. The breeder has piebald and normal horses to breed from. How could the breeder use crosses to make sure that the pair of horses were pure breeding?

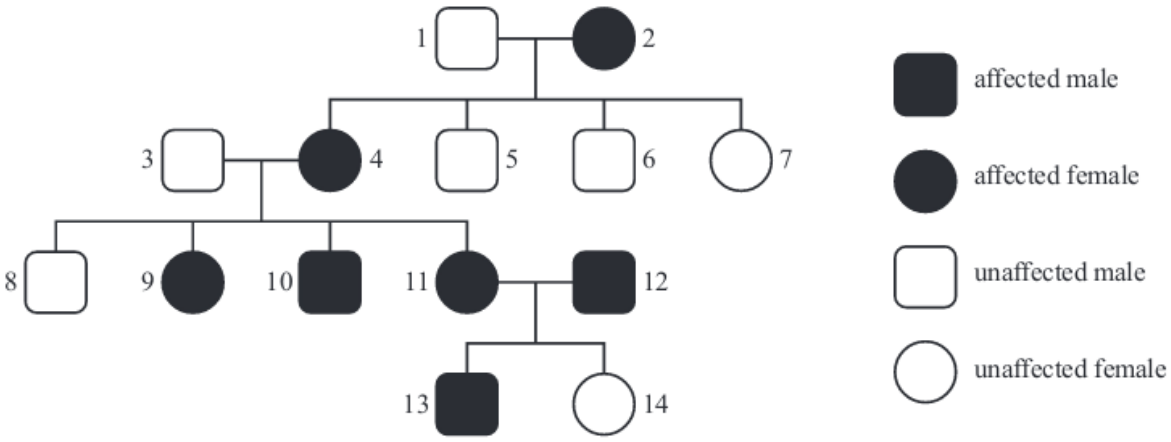
Homework

1. [NZQA 2016] The Venus flytrap plants come in a number of different types, such as the "B-52" with a red leaf. A teacher brought two identical plants to class and put them in different parts of the classroom. The Venus flytrap put near a window grew short leaves and the Venus flytrap in the shade grew long leaves. Colour variation in the leaves of the Venus flytraps can be passed on to a plant's offspring, but the different leaf length cannot. Explain why.

   In your answer you should:

   - define inheritable and non-inheritable variation
   - explain what causes inheritable and non-inheritable variations.

2. [NZQA 2016] Photic sneezing is a condition which causes affected people to sneeze due to bright light. It can be traced through a family, as shown in the pedigree chart. Photic sneezing (A) is dominant to unaffected (a).



   (a) Work out the genomes of individuals 1, 2, 11, and 12.

   (b) Explain how the pedigree chart can be used to show that Photic sneezing is dominant, but it cannot be used to determine the genotype of individual 13. You may use a Punnett square.