E - Bio Worksheet

Pedigree Analysis In Genetics

Background Reading – pedigree analysis Nelson Biology, Campbell Biology

Purpose - To introduce students to the role of pedigree charts in tracing human traits.

Introduction

Pedigree charts are often constructed to show the inheritance of genetic conditions within a family. Such charts are a great help in determining whether a phenotype is controlled by a dominant, recessive or sex-linked allele.

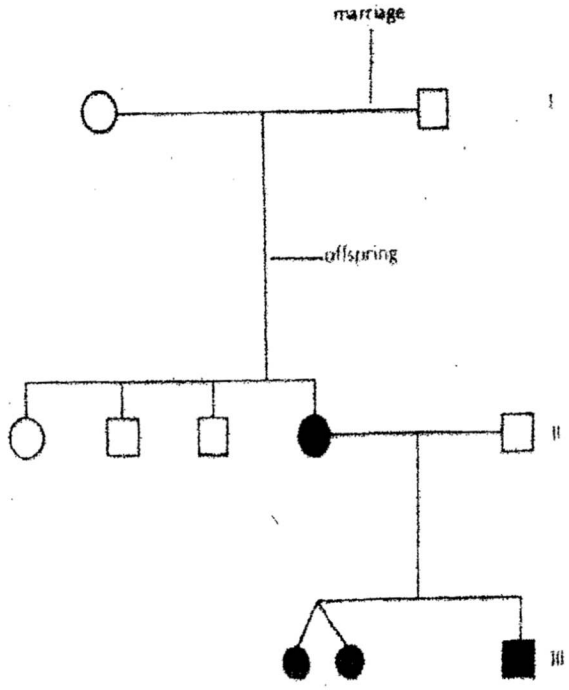
Part I - Understanding The Pedigree

1. **Table I** shows the symbols needed in understanding a pedigree. In **FIGURE I** Generation I is made up of grandparents, Generation II is their children and Generation III is their grandchildren.

Table I - Pedigree Key

Symbol	Meaning
○	Female without trait
□	Male without trait
●	Female with trait
■	Male with trait
•	Female, died in infancy
▪	Male, died in infancy
△	Identical twins

Figure I - Sample Pedigree



Q1 - How many normal males are represented in Figure I ? Normal females ?
Q2 - How many children did the grandparents have ?
Q3 - How many affected individuals are present ?

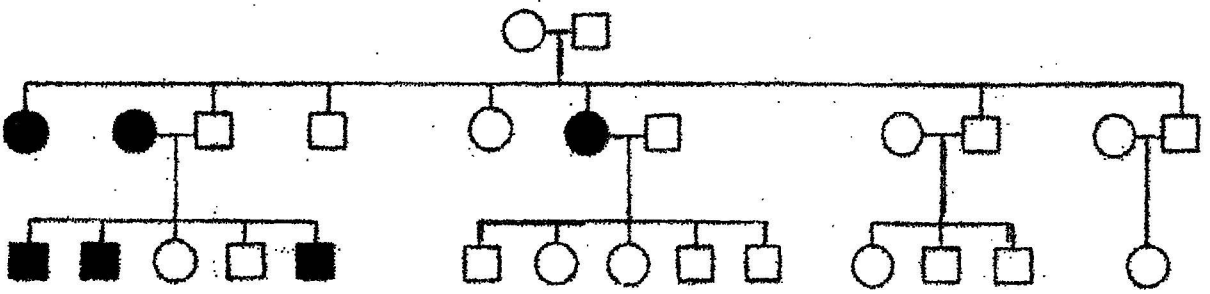
Part III - Trait Analysis

1. The following pedigrees will be used to determine whether the trait is autosomal dominant or autosomal recessive. In tracing autosomal alleles, if both parents have the disorder and the offspring do not, the condition is autosomal dominant. If neither parent shows the disorder but some of their children do, the condition is autosomal recessive. A carrier is an individual who appears to be normal, but who is capable of passing on a gene for the disorder. If the characteristic is dominant, there can be no carriers because only a single gene is needed to show the disorder. **Table II** provides some keys for your answers.

Table II - Pedigree Keys

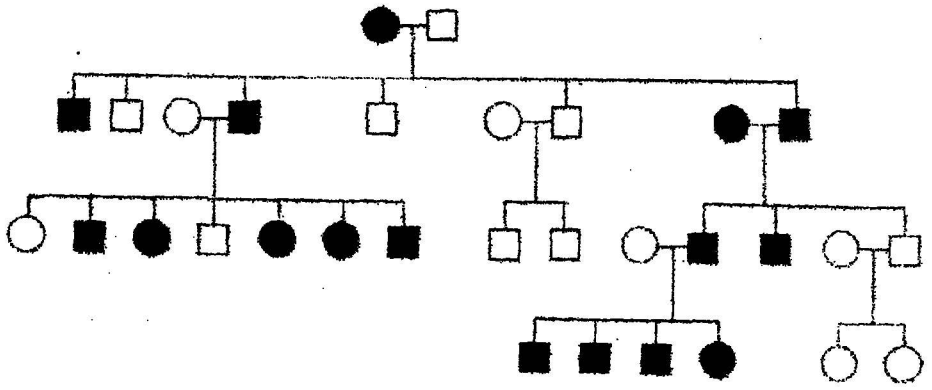
CHARACTERISTIC	KEY
AUTOSOMAL DOMINANT	AA = AFFECTED Aa = AFFECTED aa = NORMAL
AUTOSOMAL RECESSIVE	AA = NORMAL Aa = CARRIER aa = AFFECTED

Figure IV - Pedigree 1



Q8 - Is the gene for the condition autosomal dominant or recessive ?
Q9 - Identify the pedigree for each individual using the above table. Use **A_** if undetermined.

Figure V - Pedigree 2



Q10 - Is the gene for the condition autosomal dominant or recessive ?
Q11 - Identify the pedigree for each individual using the above table. Use **A_** if undetermined.

Part V - Huntington's Disease

Huntington disease (HD) is an inherited brain disorder affecting the nervous system. It causes progressive deterioration of physical and mental capabilities, leading ultimately to severe incapacitation and eventual death, generally 15-25 years after onset. Primarily, it affects adults, usually appearing between the ages of 30 and 45. Occasionally, HD symptoms appear earlier (before age 20, the juvenile form) or later (after age 50.) Common symptoms of adult-onset HD are involuntary movements, abnormal gait, slurred speech, difficulty with swallowing, cognitive impairment and personality changes. **IT IS A DOMINANT TRAIT.**

Francis knows that her mother has Huntington disease. She deduces that at lease on of her maternal grandparents was a sufferer.

(A) Is her reasoning correct?

(B) She also deduces that at least one of her great-grandparents was a sufferer. Is she correct?

(C) Francis draws the family tree found below. Many of the circles and squares are left white because the genotype cannot be determined. Is it possible for Francis not to develop the disease?