BANC 111: Human Population Genetics
TUTOR MARKED ASSIGNMENT
(TMA)

Course Code: BANC 111
Assignment Code: BANC 111/ASST/TMA/ July 2026 and January 2027
Total Marks: 100

Read the instructions carefully and answer accordingly. There are three Sections in the Assignment. Answer all questions from all the sections.

Assignment I

Answer the following in about 500 words each. 20x2= 40

a. Briefly examine Mendel's laws of Inheritance with suitable examples.
b. What are complex diseases? Elaborate on environmental factors affecting complex diseases.

Assignment II

Answer any **two** of the following questions in about 250 words each. 10x2=20

a. Define Hardy-Weinberg Law. Briefly discuss various evolutionary forces.
b. What is Genetic Polymorphism? Briefly comment on Molecular markers that exhibit polymorphism.
c. Biological consequences of parental consanguinity.

Answer the following questions in about 50 words each. 2x5=10

a. Negative Assortative mating
b. Diabetes
c. Inbreeding
d. The Pongidae
e. Thalassemias

Assignment III

Answer the following questions in about 250 words 10x3=30

a. Briefly describe the procedure for phenotyping of ABO and RH blood groups with suitable diagrams.
b. Describe the procedure to detect colour blindness using Ishihara test plates.
c. Describe the Methods for Diagnosis of G6PD Deficiency

a. Briefly examine Mendel’s laws of Inheritance with suitable examples.

Answer

Gregor Johann Mendel explained the basic rules by which traits pass from parents to children. He performed experiments on garden pea plants, *Pisum sativum*, and published his findings in 1866. His work became the foundation of classical genetics. Mendel chose pea plants because they had clearly different characters, grew quickly and could be crossed in a controlled way. He studied traits such as tall and dwarf stems, round and wrinkled seeds, and yellow and green seed colour.

Mendel used the idea that a character is controlled by a pair of hereditary factors, now called **alleles**. One allele comes from each parent. An organism with two identical alleles, such as TT or tt, is homozygous. One with different alleles, such as Tt, is heterozygous. An expressed allele is called dominant when it masks the effect of a recessive allele in a heterozygote. These terms make his three main principles easier to understand.

Law of dominance

According to this law, when parents with contrasting forms of a trait are crossed, only one form generally appears in the first filial generation (F1). In Mendel's experiment, pure tall pea plants (TT) crossed with pure dwarf plants (tt) produced all tall F1 plants (Tt). Tallness was dominant over dwarfness, but the recessive factor was not destroyed. It remained hidden in the F1 generation and reappeared in the following generation.

Dominance explains the phenotype of a heterozygote, not the disappearance of an allele. Not every human trait follows complete dominance. For instance, the ABO blood-group system also shows codominance, as the A and B alleles are both expressed in group AB. Thus, dominance is an important pattern rather than a universal rule for all genes.

Law of segregation

The law of segregation states that the two alleles of a gene separate during formation of gametes, so each gamete receives only one allele. At fertilisation, alleles from two gametes come together again. A cross between two F1 tall plants, Tt x Tt, forms the combinations TT, Tt, Tt and tt in the F2 generation. Their genotypic ratio is 1:2:1, while the phenotypic ratio is approximately three tall plants to one dwarf plant.

This law is also called the law of purity of gametes. Its cellular basis is the separation of homologous chromosomes during meiosis. A useful extension of