RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences
Second year – Semester I End-semester Examination – April/May 2016

BIO 2102 – GENETICS & EVOLUTION

Time: One and a half (1½) hours

Answer **three (3) questions** only.

1. In humans, Oculocutaneous albinism is caused by is an autosomal recessive monogenic trait. Suppose that in a small country of one million people ("Generation 1"), there are 500 'aa' albinos and 9000 'Aa' heterozygous carriers.
   a) Estimate q, the frequency of allele a, in Generation 1.
   b) Estimate p, the frequency of allele A, in Generation 1.
   c) In the next generation of 1 million individuals (Generation 2), what are the expected numbers of 'aa' albinos and 'Aa' carriers? (Assume random mating and all other Hardy-Weinberg conditions.) Show your calculations.
   d) Has the frequency of allele 'a' changed between Generations 1 and 2? Briefly justify your answer.
   e) Briefly explain the assumptions of the Hardy-Weinberg equilibrium.

2. In tomatoes, round fruit shape (R) is dominant over long (r) and smooth fruit skin (P) is dominant over peachy skin (p). Consider the following hypothesis. A heterozygous round, heterozygous smooth plant was crossed with a long, peachy plant. The following progeny were obtained, smooth round 246 peachy long 266 smooth long 24 peachy round 27.
   a) Demonstrate that the gene for fruit shape (R or r) does not assort independently of the gene for fruit skin texture (P or p) using expected and observed phenotype ratios in the above cross.
   b) Since there is no independent assortment in the above cross, explain what sort of phenomenon is responsible for producing the observed phenotype ratio.
   c) Calculate the relative distance between the two genes on a chromosome in centiMorgan (cM) using the provided phenotype ratio.

3. a) Differentiate between adaptive and neutral evolution using appropriate examples.
   b) Briefly discuss the processes that contribute to neutral evolution.

4. Write short notes on any four of the following.
   a) X linked recessive monogenic diseases
   b) Structure of genes
   c) Stabilizing selection
   d) Catastrophism
   e) Jean-Baptiste Lamarck