Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 Level 1st Semester Examination – Sept./Oct. 2015
SCT 312-3 Breeding and Genetics

Uva Wellassa University

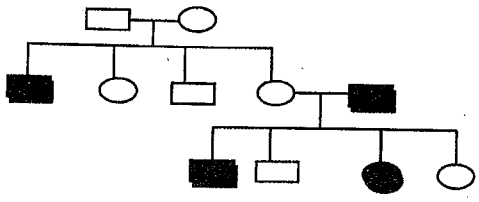
Instructions to candidates
Duration: 03 hours
Number of questions: 05 essay questions
Answer **all** questions
Mark allocation: 100 (All questions carry equal marks)

1.

a. State the benefits of pedigree analysis. (2 mark)

b. Briefly explain the reasons for genetic diseases (3 mark)

c. The following pedigree follows the inheritance of a certain x linked dominant gene which causes a particular genetic disease.



i. Find out the relevant genotypes. (4 mark)

ii. Calculate the probability of the 1st child, having the disease in progeny III. (1 mark)

iii. Calculate probability of the 1st female child, having the disease in progeny II. (1 mark)

iv. Calculate the probability of the 1st male child, having the disease in progeny II. (1 mark)

d.

i. List the enzymes responsible for the DNA replication process with their functions. (4 mark)

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ii. Briefly explain the post transcriptional modification process. (4 mark)

2.

a. Write the two mendalien laws. (2 mark)

b. State the difference between mono hybrid cross and dihybrid cross . (1 mark)

c. Briefly explain the followings terms.
   i. Test cross
   ii. Back cross
   iii. Co dominance

(6mark)

d. In humans, polydactylism (having an extra finger on each hand) is dominant to the typical 5-finger arrangement. Tongue rolling is dominant to not being able to roll one's tongue. A man who is homozygous for 5-fingers and who cannot roll their tongue has children with a woman who is heterozygous for polydactylism and tongue rolling. Draw a Punnett square that represents the cross. What is the probability that the couple will produce a polydactyl baby who cannot roll their tongue?

(4 mark)

e. Within a population of butterflies, the color brown (B) is dominant over the color white (b) and 40% of all butterflies are white. Calculate the followings according to the Hardy-Weinberg equation.

   i. The percentage of butterflies in the population that are heterozygous. (5 mark)

   ii. The frequency of homozygous dominant individuals. (2 mark)

3.

a. What do you mean by plant domestication? (2 mark)

b. State five centres of origin of world crops and give two example crops for each of the centre.

(10 mark)

c. Why is the importance of studying centres of origin of world crops? (3 mark)

d. What are the important plant traits in early crop domestication? Your answer should include at least five important traits.

(5 mark)

4. Suppose that you have an elite rice variety which is very popular amongst the farmers. This elite rice variety is susceptible to "Kernel smut" disease caused by fungi *Tilletia barclayana.* However *Oryza nivara* which is a wild progenitor of the cultivated rice *Oryza sativa* has been found resistant to "Kernel smut" disease.

a. Suggest a suitable breeding method to incorporate the resistant gene from *Oryza nivara* to elite rice variety giving all the important steps. Identify the male and female parents in your breeding program.

(5 mark)

b. Giving details of a suitable breeding method, explain how you would regain the original genome (over 98%) of your elite rice variety by reducing the genome of *Oryza nivara.*

(15 mark)

5.

a. What do you mean by "hybrid vigor? (5 mark)

b. Describe the procedure for producing hybrid seeds using two superior corn varieties as parents. (Your answer should include all the steps in the breeding program).

(10 mark)

c. What would happen to hybrid vigor, if you use open-pollinated seeds (F2) of a hybrid corn cultivation, to establish the next generation?

(5 mark)