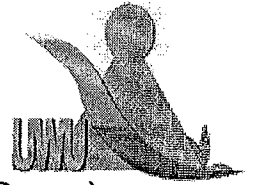




Uva Wellassa University, Sri Lanka

End Semester Examination – February/March 2012

SCT 312-3 Breeding & Genetics/ SCT 312-3 Breeding & Genetics (Repeat)



Time: Three (03) hours

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Total Six (06) Questions

Answer two (02) questions from Part A and all the questions from Part B.

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Part A

1.

- (i) List down the possible enzymes and their functions in DNA replication. (06 marks)
- (ii) Describe the steps involve in the transcription process. (08 marks)
- (iii) A group of PhD students, working in the rice genome project of University of California, wanted to find out the possible m-RNA which was generated from a particular DNA segment that they isolated from rice (*Oryza sativa*) root. The sequence of one strand (strand 'A') of that segment is as follows.

-AGCTTGGCTATAGTCAAATGGC-

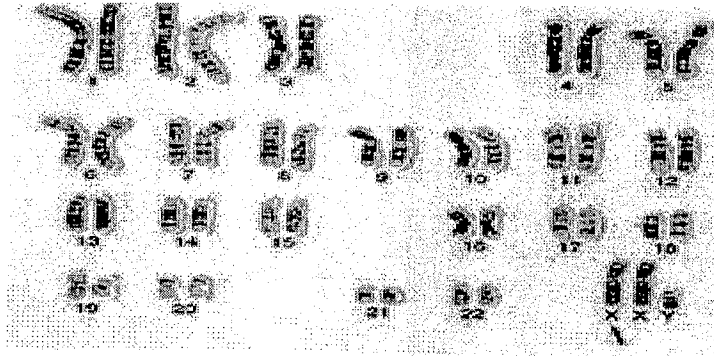
Predict the opposite (complementary) DNA sequence (strand 'B') and write the possible m-RNA sequence which is derived from the strand 'B'. (02 marks)

- (iv) How can you synthesis a DNA sequence form the m-RNA sequence? (02 marks)
- (v) What is meant by "post transcriptional modification"? (02 marks)

2.

(i) State the difference between spontaneous mutation and induced mutations. (02 marks)

(ii) A karyotype was generated from a baby who showed a certain genetic disease.



a. What is this genetic disease? (02 marks)

b. State the possible reason for this disease. (02 marks)

c. Write down two symptoms of this disease. (02 marks)

(iii) Certain genetic abnormality expresses by having x-linked dominant allele.

Abnormal woman get married to a normal man and from that marriage they got two offsprings. The first offspring is a female who is normal. That normal female get married to an abnormal man and their first abnormal female offspring get married to a abnormal man and they got two female offspring both having abnormal condition.

a. Draw the pedigree and find the genotypes. (06 marks)

b. Find the probability of having normal female offspring in the progeny three? (04 marks)

c. What is the benefit of analyzing pedigree of an organism? (02 marks)

3. Following description is based on coat colour of mice.

Normal wild type coat colour is agouti, a grayish pattern is formed by alternating bands of pigment on each hair. Agouti is dominant to black (non agouti) hair, which is caused by a recessive mutation, *a*. Thus *A* results in agouti, while *aa* yields black coat colour. When it is homozygous, a recessive mutation, *b*, at a separate locus, eliminates pigmentation altogether, yielding albino mice *bb*, regardless of the genotype at the other locus.

A cross is made between albino mice and black colour mice.

F1 Phenotypic ratios are as follows

1/4 agouti, 1/4 black, 1/2 albino

Note: gene *A* represents the coat colour of mice

- (i) Briefly explain the genetic basis of this incident? (06 marks)
- (ii) Find the genotypes of F1 generation. (10 marks)
- (iii) A group of scientists wanted to design an experiment related to the inheritance of body colour of mammals. Therefore, the black colour mouse of F1 generation was crossed with albino mouse whose coat colour gene was heterozygous. Find the genotypic ratio of this cross. (04 marks)

#### Part B

4.

- (i) What are polyploids? (05 marks)
- (ii) Briefly describe how natural polyploids are created? (05 marks)
- (iii) Explain how polyploidy is induced artificially? (05 marks)
- (iv) Explain why polyploids are important in plant breeding? (05 marks)



5. Write short notes on any two (02) of the following.

(i) Hybrid vigour (or heterosis).

(ii) Inbreeding depression.

(iii) Artificial selection in plant breeding.

(20 marks)

6.

(i) What are the main objectives of plant breeding? Name five and explain giving examples.

(10 marks)

(ii) What were the important plant traits in early domestication? Name four and explain why those traits were important.

(05 marks)

(iii) A self-fertilizing crop plant with a heterozygous allele for an important trait was self-pollinated for successive generations. What would be the percentage of homozygosity of this allele after six generations of selfing (use standard equations for your calculation)?

(05 marks)