

THE OPEN UNIVERSITY OF SRI LANKA  
B.Sc. DEGREE PROGRAMME – LEVEL 04

FINAL EXAMINATION – 2012/2013

BOTANY

BOU2101/BOE4101 – GENETICS and EVOLUTION



DURATION : TWO (02) HOURS

DATE : 4<sup>th</sup> June 2013

TIME : 9.30 – 11.30 a.m.

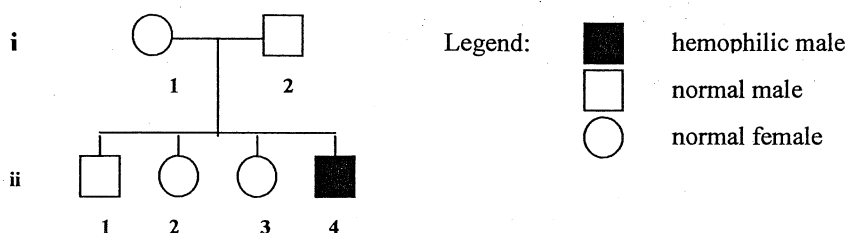
ANSWER **FOUR (04)** QUESTIONS SELECTING AT LEAST **ONE (01)** FROM EACH PART

### PART A

1.

A) What are sex linked genes?

B) A recessive sex-linked gene (h) prolongs the blood-clotting time, resulting in what is commonly called “breeder’s disease” (hemophilia). From the information given in the pedigree, answer the following questions.



- a) If **ii-2** marries a normal man, what is the chance of her first child being a hemophilic boy?
- b) Suppose her first child is actually hemophilic, what is the probability that her second child will be a hemophilic boy?
- c) If **ii-3** marries a hemophilic man, what is the probability that her first child will be normal?
- d) If the mother of **i-1** was phenotypically normal, what was the phenotype of her father?

2.

A) Explain briefly why three-point crosses are useful in learning about the nature of gene linkage.

B) A gene called “forked” (*f*) produces shortened, bent, or split bristles and hairs in *Drosophila*. Another gene called “outstretched” (*od*) results in wings being carried at right angles to the body. A third gene called “garnet” (*g*) produces pinkish eye colour in young flies. Wild-type females heterozygous at all three loci were test crossed to mutant males and the progeny appeared as follows.

57	garnet, outstretched
419	garnet, forked
60	forked
1	outstretched, forked
2	garnet
430	outstretched
13	wild-type
9	outstretched, garnet, forked

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- a) Which gene is in the middle?
- b) Calculate the map distance.
- c) What were the linkage relationship between alleles at the forked & outstretched, and forked & garnet loci?

3.

A) Explain the following very briefly with examples

- (a) Dominance
- (b) Partial (incomplete) dominance
- (c) Co-dominance

B) In rabbits, females homozygous for the dominant  $A$  allele are black and  $aa$  homozygous are orange. When black and orange rabbits are mated, the female progeny are always 'tortoise-shell' and their coats show a mottling of small black and orange patches, while the male progeny have the same coat colour as their mother. Only very rarely are male tortoise-shell rabbits found.

- i) How do you explain these results ?
- ii) What progeny are expected if tortoise-shell females are mated with black males ?

## PART B

4. Explain how different types of reproductive isolation mechanisms contribute to speciation.

5. Discuss how the macroevolution is supported by scientific evidence from different fields.

6. Write short notes on any three of the following;

- (a) Hardy-Weinberg Law
- (b) Distinguishing features between two primates; the ape and man
- (c) Proteinoid microspheres
- (d) Industrial melanism
- (e) Jurassic period

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