

THE OPEN UNIVERSITY OF SRI LANKA

B. Sc. DEGREE PROGRAMME – LEVEL 04 – 2010/2011

Botany – BOU 2101/ BTE 4101 – Genetics and Evolution



ASSESSMENT TEST 1 – OPEN BOOK TEST (OBT)

Reg. No. \_\_\_\_\_

DURATION : ONE HOUR (11.00 a.m – 12.00 noon) DATE : 16.10.2010

**ANSWER ALL QUESTIONS**

(This paper contains four (04) questions and seven (07) pages)

1.

a) What is sex linkage ?

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b) In tomato the genes for jointless (j), hairless (hl) and leafy (lf) are known to be linked on chromosome 5. Plants heterozygous for these gene pairs,  $j^+j$   $hl^+hl$   $lf^+lf$  were testcrossed and the progeny is listed below.

①

Phenotypes of progeny			Number
jointed	hairless	normal	142
jointless	hairy	leafy	139
jointed	hairy	leafy	9
jointless	hairless	normal	10
jointed	hairy	normal	96
jointless	hairless	leafy	103
jointless	hairy	normal	1
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			500

c) What is the correct sequence of genes in the linkage group?

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d) What is the correct linkage phase of the trihybrid parent?

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e) What are the map distances between the loci?

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2.

a) What is/are the use/s of Pedigree analysis?

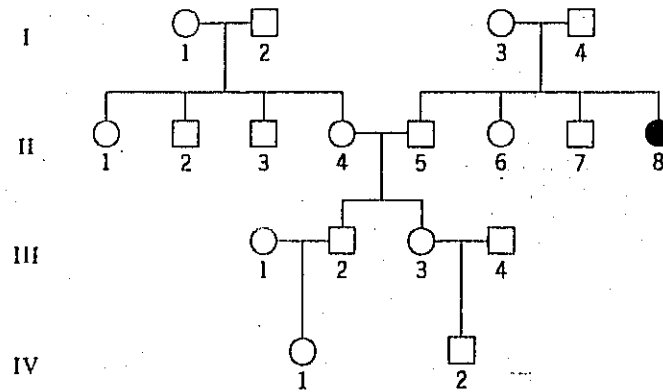
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b) The Jumping Frenchman of Maine disorder (caused by homozygosity for a rare recessive allele) is characterized by an abnormal, exaggerated, startle reflex reaction. It occurs in about 25 out of a million people in Maine and southeastern Canada. Study the following pedigree.



①

- c) If IV-1 marries at random in the population and does not marry a relative, what is the chance that her first child will be affected with the jumping disorder?  
The frequency of heterozygous individuals in the population is about 0.01.

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- d) If IV-1 marries her cousin IV-2, what is the probability that her first child will be affected with the jumping disorder?

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3.

a) What is heritability ?

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b) Explain the relationship between heritability and environment?

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c) The total genetic variance of 170 day body weight in a population of goats is  $230 \text{ lb}^2$ . The environmental variance is  $330 \text{ lb}^2$ . What is the heritability estimate of this trait ?

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4.

a) What is epistasis ?

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b) Coat colours of rabbits depend on the action of at least two genes. At one locus an inhibitor of coat colour pigment ( $I$ -) prevents the expression of colour alleles at another independently assorting locus, producing white coat colour. When the recessive condition exists at the inhibitor locus ( $ii$ ), the alleles of the hypostatic locus may be expressed,  $iiBB$ - producing black and  $iibb$  producing brown. When dihybrid white rabbits are mated together,

i) What are the phenotypic proportions expected in the progeny ?

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ii) Name the type of genetic interaction found in question b (i).

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iii) What is the chance of choosing from among the white progeny, a genotype homozygous at both loci ?

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