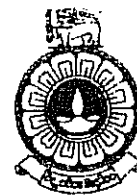


THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. DEGREE PROGRAMME – LEVEL 04
FINAL EXAMINATION – 2004/2005



BOTANY

BTU 2102/BTE 4102/BTI 4102 – GENETICS, EVOLUTION & INTRODUCTORY
MOLECULAR BIOLOGY

DURATION : TWO and HALF (21/2) HOURS

DATE : 03. 06. 06

TIME : 10.00 a.m. to 12.30 p.m.

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

PART A

1.

- A) What are gene interactions ? Briefly explain.
- B) The white leghorn breed of chickens is known to carry in homozygous conditions a colour allele (*C*) and a dominant inhibitor (*I*) that prevents the action of *C*. The white wyandotte (*iicc*) has neither the inhibitor nor the colour gene.
- i) Give the F_2 phenotypes and properties expected from crossing a white leghorn (*IICC*) with a white wyandotte (*iicc*).
- ii) Explain the type of interaction involved.

PART B

4.

A) What would be the effect of a mutation in the initiating codon of an mRNA ?

B) With the help of Table 1 and the following genetic code,

5' AUGAGAUACCAUGGGCUGAAUGUGAAAA 3'

i) predict,

a) the amino acid sequence of the small polypeptide encoded in this prokaryotic mini-message.

ii) What amino acid sequences would result if the following changes occurred in the message ?

a) the first C is changed to a G.

b) the first U is changed to a G.

c) the first C is changed to a U

d) the second G is changed to an A.

e) the first C is deleted.

f) an extra G is added after the first G.

TABLE 1 Second position

		Second position				
		U	C	A	G	
First position (5'-end)	U	UUU } Phe	UCU } Ser	UAU } Tyr	UGU } Cys	
		UUC } Phe		UAC } Tyr	UGC } Cys	
		UUA } Leu		UCA } Ser	UAA } STOP	UGA STOP
		UUG } Leu		UCG } Ser	UAG } STOP	UGG Trp
	C	GUU } Leu	CCU } Pro	CAU } His	CGU } Arg	
		GUC } Leu		CAC } His	CGC } Arg	
		CUA } Leu		CAA } Gln	CGA } Arg	
		CUG } Leu		CAG } Gln	CGG } Arg	
	A	AAU } Ile	ACU } Thr	AAU } Asn	AGU } Ser	
		AUC } Ile		AAC } Asn	AGC } Ser	
		AUA } Ile		AAA } Lys	AGA } Arg	
		AUG Met		AAG } Lys	AGG } Arg	
	G	GUU } Val	GCU } Ala	GAU } Asp	GGU } Gly	
		GUC } Val		GCC } Ala	GAC } Asp	GGC } Gly
		GUA } Val		GCA } Ala	GAA } Glu	GGA } Gly
		GUG } Val		GCG } Ala	GAG } Glu	GGG } Gly

Third position (3'-end)

The genetic code. All sixty-four codons are listed, along with the amino acid for which each codes.

PART B

4.

A) What would be the effect of a mutation in the initiating codon of an mRNA ?

B) With the help of Table 1 and the following genetic code,

5' AUGAGAUACCAUGGGCUAAUGUGAAAA 3'

i) predict,

a) the amino acid sequence of the small polypeptide encoded in this prokaryotic mini-message.

ii) What amino acid sequences would result if the following changes occurred in the message ?

- a) the first C is changed to a G.
- b) the first U is changed to a G.
- c) the first C is changed to a U
- d) the second G is changed to an A.
- e) the first C is deleted.
- f) an extra G is added after the first G.

TABLE 1 Second position

		U	C	A	G		
First position (5'-end)	Phe	UUU	Ser	UAU	Cys	Third position (3'-end)	
		UUC		UAC			UGC
		UUA		STOP			UGA STOP
		UUG					UGG Trp
	Leu	UCU	Pro	CAU	Arg		
		UCC		CAG			CGC
		UCA		Gln			CGA
		UCG					CAG
	Ile	CCU	Thr	AAU	Ser		
		CCC		AAC			AGC
		CCA		Lys	AGA		
		CCG			AAG		AGG
	Met	ACU	Ala	GAU	Gly		
	Val	ACC		GAC			GGU
		ACA		Glu			GGA
		ACG					GAG
GCU		GCC	GAA	GGA			
GUC	GCC	GAG	GGC				
GUA	GCA	GAA	GGA				
GUG	GCG	GAG	GGG				

The genetic code. All sixty-four codons are listed, along with the amino acid for which each codes.

C) DNAs of the bacteriophage T₂ contains 2×10^5 base pairs. (The molecular weight of T₂ is 1.3×10^8). How many genes of average size (encoding proteins of about 40,000 molecular weight) can this phage contain ?

Assume : The average molecular weight of an amino acid is 100.

5. Explain how the reproductive isolating mechanisms prevent the gene flow between species.

6. Write short notes on **any two** of the following.

- a) The major ways by which natural selection acts on a trait (character) that varies in a population.
- b) Continental drift.
- c) Mammalian fauna of the Australian region.
- d) Characteristics that distinguish man from apes.

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