

UNIVERSITY OF FORT HARE

Information Flow and
Introduction to Bioinformatics
BCH 323

SUPPLEMENTARY EXAMINATIONS

NOVEMBER

2024

Time: 3 Hours

Subject: BCH 323

Marks: 100

This paper consists of 3 pages including the cover page

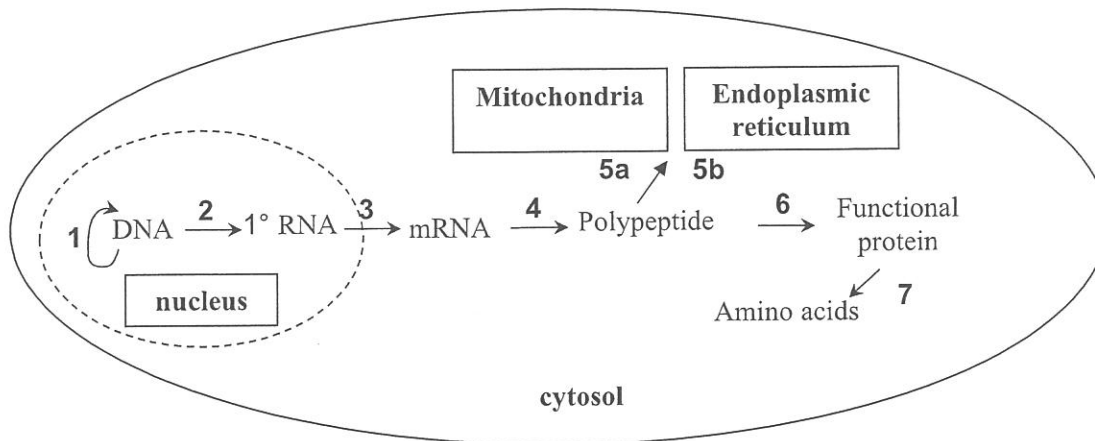
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INSTRUCTIONS

1. Answer all the questions
2. Calculators are allowed
3. No cell phones are allowed

A cartoon of a “typical” eukaryotic cell is shown below.



QUESTION 1 (12)

Identify each of the processes labelled 1 to 7 and the major enzymes/molecules involved in the processes labelled 1; 2; 4 and 7.

QUESTION 2 (15)

Describe in full the process occurring in Eukaryotes during step 2, listing all the enzymes, proteins and cofactors involved. Highlight where differences occur between Eukaryotes and Prokaryotes and provide possible explanations for these differences.

QUESTION 3 (15)

Describe the different types of mutations that can occur in a cell, what their effect may be on the protein encoded by the gene and discuss whether they are potentially lethal to the cell or not. Justify your answer.

QUESTION 4 (8)

During step 2, two processes are carried out in order to ensure the stability of 1° RNA. What are these processes and how do they stabilise the 1° RNA molecule?

QUESTION 5 (10)

Consider the following coding strand of a double stranded DNA sequence:

5'-A ATG CAA CTG CCC AGA TGA CA-3'.

- Write down the sequence of the mRNA that would be transcribed from the DNA, indicating its polarity and the region that would code for protein.
- Write down the amino acid sequence of the protein, encoded by the mRNA, using the coding table supplied.

QUESTION 6 (8)

Describe how the regulation of the lac operon is controlled under the following conditions, with specific reference to the lac I gene, promoter, CAP, cAMP, and transcription of the structural genes:

- High Lactose no Glucose
- High Glucose no Lactose
- High Lactose and Glucose

QUESTION 7 (10)

Describe in detail the two processes involved in **steps 5a & 5b**, indicating the role/s of relevant protein/s involved.

QUESTION 8 (10)

List the nine (9) possible modifications that may occur in **step 6** and explain why each of these processes may be necessary for the proper functioning of a cell.

QUESTION 9 (12)

Describe in detail the two possible processes that are involved in **step 7**, with specific reference to the conditions each will occur under, the proteins involved and how they are regulated.

[100]

		Second position					
		U	C	A	G		
U	UUU } Phe	UCU } Ser	UAU } Tyr	UGU } Cys	U		
	UUC } Phe	UCC } Ser	UAC } Tyr	UGC } Cys	C		
	UUA } Leu	UCA } Ser	UAA Stop	UGA Stop	A		
	UUG } Leu	UCG } Ser	UAG Stop	UGG Trp	G		
C	CUU } Leu	CCU } Pro	CAU } His	CGU } Arg	U		
	CUC } Leu	CCC } Pro	CAC } His	CGC } Arg	C		
	CUA } Leu	CCA } Pro	CAA } Gln	CGA } Arg	A		
	CUG } Leu	CCG } Pro	CAG } Gln	CGG } Arg	G		
A	AUU } Ile	ACU } Thr	AAU } Asn	AGU } Ser	U		
	AUC } Ile	ACC } Thr	AAC } Asn	AGC } Ser	C		
	AUA } Ile	ACA } Thr	AAA } Lys	AGA } Arg	A		
	AUG Met/start	ACG } Thr	AAG } Lys	AGG } Arg	G		
G	GUU } Val	GCU } Ala	GAU } Asp	GGU } Gly	U		
	GUC } Val	GCC } Ala	GAC } Asp	GGC } Gly	C		
	GUA } Val	GCA } Ala	GAA } Glu	GGA } Gly	A		
	GUG } Val	GCG } Ala	GAG } Glu	GGG } Gly	G		

